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Immigration, Wages, and Compositional Amenities

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Non-Technical Abstract

Economists are often puzzled by the stronger public opposition to immigration than trade, since the two policies have symmetric effects on wages. Unlike trade, however, immigration changes the composition of the local population, imposing potential externalities on natives. While previous studies have focused on fiscal spillovers, a broader class of externalities arise because people value the 'compositional amenities' associated with the characteristics of their neighbors and co-workers. In this paper we present a new method for quantifying the relative importance of these amenities in shaping attitudes toward immigration. We use data for 21 countries in the 2002 European Social Survey, which included a series of questions on the economic and social impacts of immigration, as well as on the desirability of increasing or reducing immigrant inflows. We find that individual attitudes toward immigration policy reflect a combination of concerns over conventional economic impacts (i.e., on wages and taxes) and compositional amenities, with substantially more weight on composition effects. Most of the difference in attitudes to immigration between more and less educated natives is attributable to heightened concerns over compositional amenities among the less-educated.

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ABSTRACT

Economists are often puzzled by the stronger public opposition to immigration than trade, since the two policies have symmetric effects on wages. Unlike trade, however, immigration changes the composition of the local population, imposing potential externalities on natives. While previous studies have focused on fiscal spillovers, a broader class of externalities arise because people value the 'compositional amenities' associated with the characteristics of their neighbors and co-workers. In this paper we present a new method for quantifying the relative importance of these amenities in shaping attitudes toward immigration. We use data for 21 countries in the 2002 European Social Survey, which included a series of questions on the economic and social impacts of immigration, as well as on the desirability of increasing or reducing immigrant inflows. We find that individual attitudes toward immigration policy reflect a combination of concerns over conventional economic impacts (i.e., on wages and taxes) and compositional amenities, with substantially more weight on composition effects. Most of the difference in attitudes to immigration between more and less educated natives is attributable to heightened concerns over compositional amenities among the less-educated.

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Standard economic reasoning suggests that immigration, like trade, creates a surplus that *in principle* can be redistributed so all natives are better off (Mundell, 1957). In practice the redistributive mechanisms are incomplete so both policies tend to create winners and losers. Even so, public support for increased immigration is far weaker than for expanding trade.[1] While the two policies have symmetric effects on relative factor prices, immigration also changes the composition of the receiving country's population, imposing externalities on the existing population. Previous studies have focused on the *fiscal* externalities created by redistributive taxes and benefits (e.g., MaCurdy, Nechyba, and Bhattacharya, 1998; Borjas, 1999, Hanson, Scheve and Slaughter, 2007). A wider class of externalities arise through the fact that people value the 'compositional amenities' associated with the characteristics of their neighbors and co-workers. Such preferences are central to understanding discrimination (Becker, 1957) and choices between neighborhoods and schools (e.g., Bayer, Ferreira, and McMillan, 2007) and arguably play an important role in mediating views about immigration.

This paper presents a new method for quantifying the relative importance of compositional amenities in shaping individual attitudes toward immigration. The key to our approach is a series of questions included in the 2002 European Social Survey (ESS) that elicited views on the effects of immigration on specific domains – including impacts on relative wages and the fiscal balance, and a country's culture life – as well as on the importance of maintaining shared religious beliefs, language, and customs. We use a latent-factor approach to combine these questions into two factors: one representing concerns over wages, taxes and benefits; and another representing concerns over

[1] For example, a recent international opinion poll conducted by the Pew Foundation (Pew Global Attitudes Project, 2007) found uniformly more positive views for free trade than for immigration. Mayda (2008) documents the same divergence using data from the International Social Survey Program.

compositional amenities. We then relate views on immigration policy, and overall assessments about the effect of immigration on the economy and the quality of life, to these latent factors. Our method yields a simple decomposition of the differences in opinions between demographic groups (e.g., more and less educated worker) into differences in the two types of concerns.

Our empirical analysis leads to three main conclusions. First, we find that attitudes to immigration – expressed by the answer to a question of whether more or fewer immigrants from certain source countries should be permitted to enter, for example – reflect a *combination* of concerns over compositional amenities and the direct economic impacts of immigration on wages and taxes. Second, we find that the strength of the concerns that people express over the two channels are positively correlated. This means that studies that focus exclusively on one factor or the other capture a reasonable share of the variation in attitudes for or against increased immigration.[2]

Our third conclusion is that concerns over compositional amenities are substantially more important than concerns over the impacts on wages and taxes.[3] Specifically, variation in concerns over compositional amenities explain 3-5 *times more* of the individual-specific variation in answers to the question of whether more or fewer immigrants should be permitted to enter than does variation in concerns over wages and taxes. Concerns over compositional amenities are even more important in understanding attitudes toward immigrant groups that are ethnically different, or come from poorer

[2] Some previous studies of attitudes toward immigration have ignored compositional amenity effects (e.g., Scheve and Slaughter, 2001) while others have focused on "non-economic" explanations for anti-immigrant attitudes (Espenshade and Hempstead, 1996). An exception is Mayda (2006), who focuses on both economic and non-economic factors. We interpret concerns over racial and cultural homogeneity – which are sometimes interpreted as "non-economic" factors – as expressing the importance of compositional amenities.

[3] A similar conclusion is reached by Citrin, Green, Muste and Wong (1997) using data for the U.S. and by Dustmann and Preston (2007) using data for the U.K.

countries. Similarly, differences in concerns over compositional amenities account for about 70% of the gap between high- and low-education respondents over whether more immigrants should be permitted to enter the country.

Interestingly, concerns over the direct economic impacts of immigration explain a much larger share of variation in responses to a summary question of whether immigration is good or bad for the economy. The contrast suggests that respondents make a distinction between the wage and tax effects of immigration and the effects on the composition of the host country, and place substantial weight on the latter in forming overall views about immigration policies.

The next section of the paper describes our methodology for evaluating the relative importance of concerns over direct economic impacts and compositional amenities in shaping attitudes toward immigration. We describe our basic factor model and the assumptions we use to identify the model using the questions in the ESS. Section III gives a brief overview of the ESS and the patterns of responses to the key questions about immigration in the survey. Section IV presents our main empirical findings, while Section V presents a series of extensions and robustness checks. We summarize our main conclusions in Section VI.

II. Theoretical Framework and Estimation Methodology

a. Basic Framework

Assume that a given individual (indexed by *i*) evaluates alternative policy scenarios though an indirect utility function that depends on his or her net income and on the characteristics of his or her community:

$$u_i(w_i + b_i - t_i , a_i) ,$$

where w_i represents individual *i*'s gross income, b_i and t_i represent transfer benefits and taxes, respectively, and a_i is a (multi-dimensional) summary of the characteristics of *i*'s community, including such features as the racial composition and religious affiliation of *i*'s neighborhood and workplace, and the mean income and poverty rate of *i*'s neighbors.

When asked to decide whether immigration should be increased or reduced, we assume that the individual compares a hypothetical environment in the presence of more or less immigrants (w_i', b_i', t_i', a_i') to the current situation (w_i^o, b_i^o, t_i^o, a_i^o) and reports a transformation of the difference in indirect utilities:

$$y_i = g_i [u_i(w_i' + b_i' - t_i' , a_i') - u_i(w_i^o + b_i^o - t_i^o, a_i^o)] ,$$

where g_i is a person-specific response function (assumed to be monotonically increasing). Taking a first order approximation, and allowing for an additive effect from a vector of covariates (X_i), the observed response of individual *i* is:

(1) $$y_i \approx \lambda_{1i} (\Delta w_i + \Delta b_i - \Delta t_i) + \lambda_{2i} \Delta a_i + \alpha X_i + \mu_i$$

where $\Delta w_i = w_i' - w_i^o$ is the difference in gross earnings between the alternative scenarios, Δb_i, Δt_i and Δa_i are the corresponding differences in benefits, taxes, and compositional amenities, respectively, and μ_i is an approximating error. Defining $\lambda_1 = E[\lambda_{1i}]$ and $\lambda_2 = E[\lambda_{2i}]$, equation (1) can be rewritten as

(2) $$y_i = \lambda_1 f_{1i} + \lambda_2 f_{2i} + \alpha X_i + \mu_i$$

where

$$f_{1i} \equiv [\lambda_{1i}/\lambda_1] \times (\Delta w_i + \Delta b_i - \Delta t_i) \quad \text{and}$$

$$f_{2i} \equiv [\lambda_{2i}/\lambda_2] \times \Delta a_i .$$

The individual-specific variables f_{1i} and f_{2i} represent the relative intensities of individual *i*'s concerns over the direct economic effect and the compositional amenity effect of the change, respectively. Note that f_{1i} and f_{2i} incorporate both the magnitudes of the changes envisioned by the individual (reflected in Δw_i, Δb_i, Δt_i, Δa_i), and the relative importance of the changes (reflected in λ_{1i}/λ_1 and λ_{2i}/λ_2).[4] An individual may express stronger concerns about the wage impacts of immigration, for example, because she projects a larger wage loss as a result of the policy, or because she has a higher marginal utility of income, or because she interprets the response scale differently (i.e., has a steeper g_i function).

We do not observe f_{1i} and f_{2i} directly. Instead, we observe responses to a series of questions that provide information about an individual's realizations of f_{1i} and f_{2i}. Specifically, we assume that the intensity of concern about direct economic effects of immigration is reflected in answers to five questions:[5]

i. Do you agree or disagree that wages and salaries are brought down by immigration?
ii Do you agree or disagree that immigrants harm the economic prospects of the poor?
iii. Do you agree or disagree that immigrants help to fill jobs where there are shortages of workers?
iv. Would you say that immigrants generally take jobs away from natives or help create new jobs?
v. On balance do you think that immigrants take out more (in health benfefits and welfare services) than they put in (in taxes)?

[4] From (1), $\lambda_{1i} = g_i' \times \partial u_i/\partial w_i$ and $\lambda_{2i} = g_i' \times \partial u_i/\partial a_i$. Thus variation in λ_{ji}/λ_j reflects variation in the way that different individuals interpret the response scale used to measure their policy views, as well as in the marginal utilities of wages and amenities.

[5] The economic impact questions in the ESS elicit respondents' views about the effects of immigration on wages and job opportunities in general, rather than about impacts on their own situation. This wording choice was influenced by the findings of Kinder and Kiewert (1981) and subsequent researchers that policy opinions are more closely aligned with answers to questions that pose sociotropic concerns than those that pose narrow self-interest concerns. Whether this is because people care more about society-wide policy impacts than personal impacts is widely debated. Our view is that answers to sociotropic questions identify the strength of personal concern about an issue, and reflect a combination of perceived personal and social impacts. A similar view is expressed in Bobo and Kluegel (1993).

We assume that concerns about compositional amenities are reflected in answers to five other questions:

vi. Do you agree or disagree that it is better for a country if everyone shares the same customs and traditions?
vii. Do you agree or disagree that it is better for a country if there is a variety of different religions?
viii. Do you agree or disagree that it is better for a country if everyone can speak one common language?
ix. Would you say that a country's cultural life is undermined or enriched by the presence of immigrants?
x. Do you agree or disagree that a country should stop immigration if it wants to reduce social tensions?

Formally, we assume that the responses to these 10 questions, denoted as $(z_{1i}, z_{2i},\ldots,z_{10i})$, are related to the underlying factors f_{1i} and f_{2i} and to observed characteristics of the respondent by a set of linear equations:[6]

(3a) $z_{ji} = M_j f_{1i} + c_j X_i + \nu_{ji}$, j=1,2,…5.

(3b) $z_{ji} = M_j f_{2i} + c_j X_i + \nu_{ji}$, j=6,7,…10.

Thus, responses to the first 5 questions are treated as noisy indicators of f_{1i}, while responses to the second group of questions are treated as noisy indicators of f_{2i}.

To complete the model, we assume that the latent factors are related to the observed respondent characteristics and a pair of idiosyncratic errors:

(4a) $f_{1i} = b_1 X_i + \omega_{1i}$

(4b) $f_{2i} = b_2 X_i + \omega_{2i}$.

Combing the preceding equations yields a set of reduced forms for the responses (y_i, z_{ji}):

(5a) $y_i = \Gamma_0 X_i + \varepsilon_{0i}$

$\Gamma_0 = \lambda_1 b_1 + \lambda_2 b_2 + \alpha$; $\varepsilon_{0i} = \lambda_1 \omega_{1i} + \lambda_2 \omega_{2i} + \mu_i$,

(5b) $z_{ji} = \Gamma_j X_i + \varepsilon_{ji}$

[6] Different questions in the ESS used different response scales. As explained below, we assign cardinal values to the ordered responses then linearly transform the responses to lie between 0 and 1.

$$\Gamma_j = M_j b_1 + c_j \;; \qquad \varepsilon_{ji} = M_j \omega_{1i} + \nu_{ji}, \quad j=1,2,\ldots 5 \;,$$

$$\Gamma_j = M_j b_2 + c_j \;; \qquad \varepsilon_{ji} = M_j \omega_{2i} + \nu_{ji}, \quad j=6,7,\ldots 10 \;.$$

These equations form a linear system with cross-equation and covariance restrictions.

Our goal is to identify the relative importance of the factors f_{1i} and f_{2i} in shaping preferences over immigration policy. We proceed by making a series of assumptions on the covariances between the error components in the structural equations (2), (3) and (4) that allow us to identify λ_1, λ_2, and the M_j's from the variance-covariance matrix of the reduced-form residuals ε_{0i} and ε_{ji} (j=1…10). The remaining parameters – in particular the coefficients α, b_1, and b_2 that determine the projection of y on the X's – are then identified from the Γ_j's (i.e., the reduced-form regression coefficients).[7]

Our key assumptions on the error components (μ_i, ν_{ji}, ω_{1i}, ω_{2i}) are:

(6a) $\mathrm{Var}[\omega_{1i} \mid X_i] = 1, \; \mathrm{Var}[\omega_{2i} \mid X_i] = 1, \; \mathrm{Cov}[\omega_{1i}, \omega_{2i} \mid X_i] = \sigma_{12}$.

(6b) $\mathrm{Var}[\nu_{ji} \mid X_i] = \varphi_j$, $\mathrm{Cov}[\nu_{ji}, \nu_{ki} \mid X_i] = 0 \;\; (j \neq k)$,

$\mathrm{Cov}[\nu_{ji}, \omega_{1i} \mid X_i] = \mathrm{Cov}[\nu_{ji}, \omega_{2i} \mid X_i] = 0$.

(6c) $\mathrm{Var}[\mu_i \mid X_i] = \sigma_\mu, \; \mathrm{Cov}[\mu_i, \omega_{1i} \mid X_i] = \mathrm{Cov}[\mu_i, \omega_{2i} \mid X_i] = \mathrm{Cov}[\mu_i, \nu_{ji} \mid X_i] = 0$.

The assumptions in (6a) are normalizations: we scale the model by assuming that the variances of the unobserved determinants f_{1i} and f_{2i} are both equal to 1, and we allow an arbitrary correlation σ_{12} between them. The assumptions in (6b) are restrictive: here we are assuming that the correlation between the structural errors for any two indicators arises solely through their joint dependence on the latent factors f_{1i} and f_{2i}. Substituting these assumptions into (5a) and (5b) we have

(7a) $\mathrm{Var}[\varepsilon_{ji} \mid X_i] = M_j^2 + \varphi_j$,

[7] In practice we follow this "two step" procedure, first estimating a model for the variance-covariance matrix of the reduced form residuals of the z's and y, then estimating α, b_1, and b_2 from the Γ_j's. In principal we could also use a 1-step method.

(7b) $\text{Cov}[\varepsilon_{ji}, \varepsilon_{ki} \mid X_i] = M_j M_k$ *if $j \neq k$ and they are from the same group of indicators*

(7c) $\text{Cov}[\varepsilon_{ji}, \varepsilon_{ki} \mid X_i] = M_j M_k \sigma_{12}$ *if $j \neq k$ and they are from different groups*.

Equations (7a)-(7c) restrict the 10×10 covariance matrix of the reduced form errors for the observed indicators to be a function of only 21 parameters: the 10 M_j's, the 10 φ_j's, and σ_{12}.

The assumptions in equation (6c) are also restrictive: here we are assuming that the structural error in the primary response equation, μ_i, is uncorrelated with the unobserved determinants of the latent factors, and with structural errors in the equations for the indicators z_{ji}. Provided the two latent factors f_{1i} and f_{2i} are the only channels that mediate concerns over immigration, these restrictions are plausible, since in that case μ_i is effectively an approximation error. As discussed below we evaluate this assumption by fitting a more general model that allows for a third independent factor representing altruistic concerns over people in other countries.

Assumptions in (6c) impose a simple structure on the covariances between the reduced form error in y and the reduced form errors for the z_j's:

(8a) $\text{Cov}[\varepsilon_{0i}, \varepsilon_{ji} \mid X_i] = (\lambda_1 + \lambda_2 \sigma_{12})M_j \quad , \qquad j \leq 5$

(8b) $\text{Cov}[\varepsilon_{0i}, \varepsilon_{ji} \mid X_i] = (\lambda_2 + \lambda_1 \sigma_{12})M_j \quad , \qquad j \geq 6 \ .$

(8c) $\text{Var}[\varepsilon_{0i} \mid X_i] = \lambda_1^2 + \lambda_2^2 + 2\lambda_1\lambda_2\sigma_{12} + \sigma_\mu .$

Given σ_{12} and the M_j's, λ_1, λ_2 and σ_μ are identified from these residual covariances.[8] In Appendix A, we explain the details of our estimation procedures, and how we calculate the standard errors.

[8] As explained below, we actually fit the system with multiple "y" variables, allowing separate values of λ_1 and λ_2 (and a separate value for the variance σ_μ) for each y-variable.

b. Decomposition of Differences Between Groups

Although the relative size of λ_1 and λ_2 identifies the relative importance of economic concerns and compositional concerns in explaining differences in attitudes within groups, a decomposition of differences in attitudes between groups requires estimates of the parameters (α, b_1, b_2). Equation (5a) specifies that the reduced-form coefficients relating y to X can be decomposed as:

$$\Gamma_0 = \lambda_1 b_1 + \lambda_2 b_2 + \alpha \ .$$

The total effect of X on y arises through three channels: economic concerns ($\lambda_1 b_1$); amenity concerns ($\lambda_2 b_2$); and any direct effect of the X's on attitudes (α). To sort out the relative importance of these channels we need estimates of α, b_1, and b_2.

Even knowing (M_j , σ_{12}, λ_1, λ_2, v) it is not possible to separately identify (α, b_1, b_2) without further assumptions. Indeed, equations (5a) and (5b) imply that the 11 reduced-form coefficient vectors (Γ_0, Γ_1,…Γ_{10}) depend on 13 structural coefficient vectors (α, b_1, b_2, c_1,… c_{10}). Obviously we need to impose some restrictions on the c's in order to identify (α, b_1, b_2) from the estimated Γ_k's. We consider three cases. As a baseline we assume that c_j=0 for j=1,2…10. Under this assumption, the X's exert no independent effect on the indicator questions. A weaker assumption is that c_j=c for j=1,2…10 (i.e., that the X's have a parallel effect on all the Z's, holding constant f_{1i} and f_{2i}). A third, even weaker assumption is that the X's have the same effects on the indicators for each of the underlying factors, i.e., that

$$c_1 = c_2 = c_3 = c_4 = c_5 = c^E \quad \text{and} \quad c_6 = c_7 = c_8 = c_9 = c_{10} = c^A \ .$$

Each of these assumptions is sufficient to allow us to identify the key coefficients (α, b_1, b_2). As we discuss in more detail below, our main decomposition results are quite similar regardless of the restrictions we impose on the c's to achieve identification.

c. Extensions

The model represented by equations (2), (3) and (4) can be extended in a number of directions. One possibility is that attitudes toward immigration depend on more than the two factors included in our basic model. As a check we add a third "altruism factor" reflecting concerns about the welfare of potential immigrants, and use a set of additional questions in the ESS as indicators of this factor. In principal other factors could also be added, although identification depends on the availability of suitable indicator questions.

A second extension is to relax (or modify) the assumed relationship between the observed indicator questions and the underlying factors. We report on two examples in Section V, below. In one variant we add a 6th potential indicator of concern over compositional amenities – a question on the potential relationship between immigration and crime ("*Are crime problems made better or worse by people coming to stay here?"*). In another variant we drop one of the indicators of economic concern ("*Do you agree or disagree that immigrants help to fill jobs where there are shortages of workers?"*) that has a relatively weak relation with the other four questions.

III. Data Sources and Descriptive Statistics

a. The 2002 ESS Survey

The European Social Survey (ESS) is an annual cross-country survey covering 21 European countries, with 1,500-3,000 respondents per country.[9] In collaboration with the ESS survey design team we developed a special immigration module for the 2002 survey. The aim of the module was to gather respondents' opinions about immigration policy, and their views on how immigration affects conditions in their country, in order to better understand the channels that mediate pro- or anti-immigrant sentiment. We developed a series of questions that attempt to distinguish between the perceived impacts of immigration on economic conditions (wages, taxes, unemployment) and social homogeneity and cohesion that we use as indicators of economic and compositional amenity concerns.

Some basic descriptive statistics for the 2002 ESS survey are presented in Appendix Table 1, which shows sample sizes and demographic characteristics of respondents in each country. The pooled sample for all 21 countries contains about 36,000 observations and is just over 50% female, has an average age of 47, is made up of about 90% natives and 10% immigrants, and includes about 3% minority group members (most of whom are immigrants). As would be expected, the shares of immigrants (and ethnic minorities) vary substantially across countries, with relatively low immigrant shares in Finland, Italy, Hungary, and Poland and relatively high fractions in Luxemburg and Switzerland. On average about one-half of respondents are employed and one-fifth are retired: these fractions also vary somewhat by country. Forty percent of respondents have only primary schooling while 18% have some tertiary education. The share of low-

[9] Israel also participated in the 2002 ESS, but is excluded from our analysis. Detailed information on the 2002 ESS design and implementation is available at http://ess.nsd.uib.no/index.jsp?year=2003&country=&module=documentation .

education respondents is relatively high in Portugal, Hungary, Spain, Greece, Italy and the UK, and relatively low in Norway and Germany.

b. Respondent Attitudes to Immigration

This subsection describes the questions in the ESS that we use to measure pro- and anti-immigrant sentiment. A preliminary issue that arises in any cross-country survey is how to define "immigrants". Although in Britain and the U.S. an "immigrant" is usually interpreted as someone born abroad, in countries with citizenship based on blood ancestry (*jus sanguinis*) "immigrants" may include people born in the country who are not citizens. To eliminate ambiguity the questions in the ESS module refer to "people who come to live in a country" (rather than immigrants or migrants) and solicit opinions about whether more or less people should be allowed to "come to live here." For readability, however, we use the term "immigrants" throughout this paper.

A related issue is how to measure respondents' views about restricting the number of immigrants from different source countries. The ESS module uses a 4-way classification: richer European countries; poorer European countries; richer non-European countries; and poorer non-European countries. It also asks separate questions about admitting people of the same or different ethnicity than the majority population, yielding a total of 6 questions on the tightening or loosening of immigration policies for specific immigrant groups. We consider responses to each of these questions as well as

the "average response" to the four country-group-specific responses (i.e., an unweighted average of the four ordinal responses).

We also examine responses to two summary assessment questions about the effect of immigration: (1) "*Would you say it is generally bad or good for [this country's] economy that people come to live here from other countries?*"; (2) *Is [this country] made a worse or a better place to live by people coming to live here from other countries?* These two, plus the seven questions on immigration policy for specific groups, form the dependent variables in our statistical analysis (i.e., the "y" variables in our model).

The ESS questionnaire elicited views about allowing more or less people to come from different source countries using a 4 point scale ("allow many to come here", "allow some", "allow a few", "allow none"). Opinions on the two summary assessment questions were elicited using an 11 point scale (scored 0 to 10).[10] Table 1 shows the distributions of the responses to these questions across all respondents in our 21-country sample.[11] For the 4-point questions (Panel A) we show the complete distribution, whereas for the 11-point questions (Panel B) we classify the responses into 5 intervals: 0-1 (relatively strong negative opinion); 2-4 (somewhat negative); 5 (the midpoint response); 6-8 (somewhat positive) and 9-10 (relatively strong positive).

The responses in Panel A suggest a diversity of opinion on the issue of immigration, with 40-45% of ESS respondents preferring to admit none, or only a few immigrants from a particular source group, and 55-60% preferring to admit some or many. Respondents are slightly more supportive of immigration from rich European

[10] I.e., respondents were asked to fill in a number between 1 and 10 with 1 representing "bad for the economy" (or "worse place to live") and 10 representing "good for the economy" (or "better place to live").
[11] In Table 1 and elsewhere in the paper we drop all missing or "don't know" responses.

countries than from poor non-European countries, although the differential is modest. They are also more favourably disposed toward people of the same ethnicity than those of a different ethnic background, but again the differential is small.

The responses to the overall assessment questions, in Panel B, reveal a similar diversity of opinion. Interestingly, people have more positive views about the economic effects of immigration than on the question of whether immigrants make the country a better place to live. For example, 38% rate the economic effect of immigration with a score of 6 or higher (on a 0-10 point scale), whereas only 28% rate the effect on the quality of life in the same positive range. In the context of our model this contrast suggests that many respondents associate immigration with negative compositional amenities that offset the economic benefits of population inflows.

For ease of interpretation we linearly re-scaled the ordinal responses to these questions so that the most positive (pro-immigrant) response is 1 and the most negative (anti-immigrant) response is 0. Table 2 shows the correlation matrix of the re-scaled responses to the 8 questions across the overall ESS sample. The main entries in the table are simple correlations, while the entries in italics are adjusted correlations, based on residuals from regressions on country dummies and a set of observed covariates (gender, age, ethnicity, employment status, and city residence). Responses to the first six immigration policy questions are highly inter-correlated, but the correlations between these questions and the overall assessment questions are weaker. The adjusted correlations are only slightly smaller in magnitude than the raw correlations, reflecting the fact that the R-squared coefficients from the first-step regressions are modest (<0.15).

Although our focus in this paper is on understanding the channels that mediate pro- and anti-immigrant sentiment within a given country, much existing research has addressed cross-country differences in attitudes toward immigration.[12] Appendix Table 2 presents the means of the standardized responses to the questions described in Tables 1 and 2 for each of the 21 countries in our sample. The range of national opinions is relatively wide: in the two countries with the most negative views about immigration (Greece and Hungary) the mean standardized response to the question on allowing more immigrants of a different ethnicity is 0.31[13], whereas in Sweden – the country with the most positive view – the mean standardized response is 0.69. Using the same metric, opinions are also relatively negative in Portugal (0.41) and Austria (0.44), and relatively positive in Switzerland (0.59) and Italy (0.57).

Figure 1 illustrates the cross-country variation in average responses to the two "overall assessment" questions. Each point in the figure represents a country: the x-axis shows the mean response to the question "*Is immigration good or bad for the economy?*" while the y-axis shows the mean response to the question "*Do immigrants make the country a better or worse place to live?*" Across countries the answers are highly correlated (ρ=0.7), though there are some notable departures from the 45 degree line. Sweden (SE) and Austria (AT) make an interesting comparison: residents of the two countries have similar (and relatively positive) opinions about the economic effect of immigrants, but much different views about their effect on quality of life. Interestingly, their responses on the immigration policy questions are more closely aligned with the

[12] Recent contributions include Gang et al. (2002); Mayda, 2006; and Davidov et al. (2009).
[13] Note that the standardized response for this question assigns a value of 1 for "allow many", 0.66 for "allow some", 0.33 for "allow few" and 0 for "allow none. A mean value of 0.31 implies that the average response is somewhat less favorable than the second lowest category.

latter: Swedes have the most positive opinion on allowing more immigrants whereas Austrians are among the most negative.

c. Indicators of Concerns about the Effects of Immigration

An innovative feature of the ESS immigration module, and the key to our identification strategy, is the series of "indicator" questions described in Section II that ask respondents about the effects of immigration on wages, job opportunities, and taxes, on one hand, and social, cultural, and linguistic cohesion on the other. Table 3 shows the mean values of the standardized responses to these indicator questions, along with the correlations of the response with three summary measures of pro- or anti-immigrant sentiment: the average response to the questions about allowing many/some/few/none people from each of the four groups of sending countries; the response to whether immigration is good or bad for the economy; and the response to whether immigrants make the country a better or worse place to live.[14]

The responses to the indicator questions for economic concerns suggest a mildly negative opinion about the effects of immigration. For example, the mean responses to the questions *"Do you agree or disagree that wages are brought down by immigration?"* and "*Do you agree or disagree that immigrants harm the economic prospects of the poor?"* are 0.49 and 0.43, respectively. Since a "neither agree nor disagree" response is scaled as 0.5 (whereas strongly agree=0 and strongly disagree=1), the average respondent is somewhat more inclined to agree. Among the indicators of concern over compositional amenities, the average responses are more variable. Respondents strongly agree with the question *"Do you agree or disagree that it is better for a country if*

[14] As with the questions on immigration policy and the overall effect of immigration, we standardize the responses to the indicator questions using a linear transformation of the original ordinal scale that sets the most negative (anti-immigrant) response to 0 and the most positive (pro-immigrant) response to 1.

everyone can speak a common language?", but are evenly split on the question *"Do you agree or disagree that it is better for a country if there is a variety of different religions?"*, and are mildly supportive of the view that immigration enriches cultural life (mean response = 0.58).

In one of our robustness checks (see section Va) we consider adding a sixth indicator of concern over compositional amenities, based on responses to the question *"Are crime problems made worse or better by people coming to live here?"*. As shown in Table 3, responses to this question suggest many people believe immigrants cause additional crime: the standardized response is 0.31 (with 0=worse and 1=better), and 40% respond in the lowest 3 categories (0-3 on a 0-10 scale) [15] Responses to this question are reasonably highly correlated with responses to the other 5 indicators of compositional concerns (with correlations between 0.16 and 0.35).

We also extend our two-factor model to three factors by defining a third channel of concern reflecting international responsibility and altruism. We use three questions as indicators for this factor:

i. Do you think that when people leave their country to come here it has a good or bad effect on their country in the long run?
ii. Do you agree or disagree that richer countries have a responsibility to accept people from poorer countries?
iii. Do you agree or disagree that all countries benefit if people can move to countries where their skills are most needed?

Responses to these three questions are summarized in the bottom rows of Table 3. ESS respondents appear to believe that emigration harms the sending country (mean response = 0.44), but also agree that richer countries have a responsibility to accept immigrants,

[15] Unlike the case in the U.S. (see e.g., Butcher and Piehl, 2007) immigrants appear to be over-represented in the prison populations in many European countries – see Wasquant, 1999.

(mean response = 0.60), and that free mobility benefits all countries (mean response = 0.68).

As shown in columns (2)-(4) of Table 3, responses to most of the indicator questions are reasonably highly correlated with views on immigration policy (column 2), and with overall assessments of the effects of immigration (columns 3 and 4). Focusing on the indicators for our two main channels, the weakest correlations are for the question of whether immigrants tend to fill shortages, and on the value of a common language. The "fill vacancies" question is also weakly correlated with the other indicators of economic concerns, and in one of our robustness checks we consider taking it out of the model. The low correlation between the "common language" question and the y-variables reflects the strong consensus among respondents on the value of a common language (which we interpret as an anti-immigrant sentiment).[16] The indicator with the highest correlation with the overall assessment questions is the one asking whether immigrants undermine or enrich cultural life. This has a 0.56 correlation with the "good or bad for the economy" question, and an even stronger 0.61 correlation with the "make the country a better or worse place" question. Responses to whether a country should "stop immigration to reduce social tensions" are also highly correlated with the overall assessment questions, and with views on immigration policy. In contrast, the indicators for altruistic concerns are relatively weakly correlated with the outcome variables.

IV. Estimation Results

a. Preliminaries

[16] Over 90 percent of respondents either strongly agree (42%) or agree (51%) with the view that a common language is better.

Our estimation procedure has three steps. First, we estimate unrestricted OLS regressions of the outcome variable (y) and the indicators (the z's) on the observed covariates X. Then we take the covariance matrix of the reduced form residuals and apply a minimum-distance technique to estimate the structural parameters ($M_1,\ldots M_{10}$, $\varphi_1,\ldots\varphi_{10}, \sigma_{12}, \lambda_1, \lambda_2, v$).[17] Finally, we use these parameters and the estimated reduced-form coefficients Γ_j (j=0,1,…10) to estimate the coefficient vectors b_1, b_2, and $c_1,\ldots c_{10}$. As explained in Appendix A, the third step is accomplished by a simple least squares algorithm.

We include in the vector X a constant, country dummies, and a set of 13 personal characteristics (all dummy variables): indicators for age (3 dummies), gender, education (2 dummies), labor force status (3 dummies), immigrant status, minority status, and city size (2 dummies). Thus, the Γ_j's and the vectors (α, b_1, b_2, c_j) all have dimension 34. As noted earlier, we use 9 different y-variables (the 8 variables listed in Table 1 plus an average of the responses to the 4 questions on allowing different groups to immigrate). Estimates of the Γ_j's for these 9 y-variables are reported in Appendix Tables A3a-A3c. Estimates for the 13 potential indicator variables, as well as the variance-covariance matrix of the estimated reduced form residuals, are available from the authors on request.

b. Results for Baseline Model

Table 4 summarizes the estimation results from our baseline specification. A more complete set of parameter estimates is presented in Appendix Tables 3. The columns of Table 4 shows the results for 3 choices of y: the average of the responses to

[17] We use unweighted minimum distance. Our methodology is summarized in Appendix A. We actually fit the model to the indicators and the full set of 9 y's jointly. Thus we estimate ($M_1,\ldots M_{10}$), ($\varphi_1,\ldots\varphi_{10}$), σ_{12}, and 9 triples of coefficients (λ_1, λ_2,v) – one triple for each y. .

the 4 questions on allowing people to immigrate (column 1); the response to whether immigration is good or bad for the economy (column 2); and the response to whether immigrants make the country better or worse (column 3). For each choice of y we show the estimated values of the "loading factors" (λ_1, λ_2), the estimate of the correlation σ_{12} between the two latent factors (which is estimated once for all the different y's), and the implied decompositions of the estimated differentials in the outcome between young (under 30) and old (over 60) respondents (rows 3a-3c), high and low educated respondents (rows 4a-4c), unemployed versus employed respondents (rows 5a-5c), and big city residents versus residents of rural areas (rows 6a-6c).[18]

Looking first at our main outcome measure – the averaged "immigration policy" variable in column 1 – the estimates of λ_1 and λ_2 are 0.025 and 0.102, respectively.[19] Since the latent factors are scaled to have unit variance, these estimates imply that concerns over compositional amenities are roughly 4 times more important in explaining the variation in opinions on immigration policy within demographic subgroups than concerns over economic issues.

The estimate of the correlation of the latent factors is relatively high (close to 0.8) so on average, people who express stronger concerns about one factor tend to express stronger concerns about the other. In the context of the model represented by equations (1) and (2) the scale of this correlation depends on the correlation of the presumed impacts of immigration on respondents' incomes and local amenities, and on how these

[18] As shown in equation (5a), the reduced form regression coefficients Γ_0 (from the regression of y on X) can be decomposed as: $\Gamma_0 = \lambda_1 b_1 + \lambda_2 b_2 + \alpha$. Since all the elements of X are dummies representing different categories of people, the estimated coefficients in Γ_0 represent differentials in mean responses across groups.

[19] This average is perhaps most similar to the question typically analyzed in the literature (e.g. Scheve and Slaughter 2001; Mayda, 2006; O'Rourke and Sinnott 2003), which asks whether immigration should be reduced or increased, with no reference to source country.

impacts are correlated with the "loudness" that people report their concerns on a survey like the ESS. If people who tend to respond to questionnaires by selecting extreme responses anticipate larger impacts of immigration on their wages and local amenities the two latent concerns will be more highly correlated than if those who tend to select responses closer to the middle anticipate larger impacts.[20] In any case, the high correlation of the latent factors suggests that one could elicit a relatively accurate overall opinion about immigration policy by only focusing on one channel or the other.

The decomposition results in rows 3-6 suggest that a relatively high fraction of the differences in opinions about immigration policy by age, education, labor force status, and city size is explained by differences in concerns over compositional amenities, whereas the contribution of economic concerns is smaller. Specifically, about 70% of the gaps between older and younger respondents, and between low-educated and high-educated respondents, are attributed to compositional concerns. The share of the gap between employed and unemployed is smaller (50%) whereas the share of the gap between large city and rural residents is a little larger (77%).

The results in column 2 for the question of whether immigration is good or bad for the economy provide an interesting contrast to those in column 1. Here, the loading factors are 0.120 and 0.038, respectively, suggesting that the latent component of variance we are identifying as "standard economic concerns" (over wages, taxes and benefits) has over a 4 times larger effect on the overall assessment about economic effects of immigration than the latent component we are identifying as "compositional

[20] Suppose that respondent i believes that an increase in immigration will lead to a change Δw_i in her wage, and a change Δa_i in the composition of her neighborhood. Suppose that people have similar indirect utility functions $u(w+b-t, a)$, but vary in their response functions g_i. Respondent i's concern about the wage effect of immigration is $g_i' \cdot \partial u/\partial w \, \Delta w_i$ while her concern about the amenity effect is $g_i' \cdot \partial u/\partial a \, \Delta a_i$. The correlation of the reported concerns depends on how g_i is correlated with Δw_i, and Δa_i.

amenity concerns." At first glance the fact that compositional concerns play any role in the response on the "good or bad for the economy" question may be interpreted as a problem for our identification assumptions. Our interpretation, however, is that respondents, like many economists, view cultural, linguistic, and ethnic diversity as potential problems for the economy. Lazear (1999) for example, has argued that a common culture and language enhance trade and specialization. Likewise a large literature in development economics concludes that ethnic diversity harms political stability and growth (see e.g., Easterly and Levine, 1997; Alesina and La Ferrera, 2003).

Consistent with the much higher value for λ_1 than λ_2, a relatively large share of the between-group differences in answers to the "good or bad for the economy" question is explained by differential economic concerns. For example, about 70% of the 0.12 gap between high- and low education respondents is attributable to economic concerns. Economic concerns more than fully explain the gaps between young and old respondents, and between the employed and unemployed.

Column 3 shows the results for a second overall assessment question – do immigrants make the country a better or worse place to live? For this question λ_1=0.047 and λ_2=0.100, implying that compositional concerns are about twice as important as economic concerns. There is some tendency for the model to "over-explain" differentials in answers to this question by age and education. Indeed, differences in compositional concerns are large enough to fully explain the age and education gaps. Differences in economic concerns contribute a little more explanatory power.

Although the average response to questions about admitting more or less immigrants is a useful summary measure of policy views, it is also interesting to compare

the relative importance of economic and compositional concerns in explaining opinions about specific immigrant groups. Table 5 shows the results for the average measure (top row of the table) and for each of the four country groups, as well as for questions about admission of people of the same or different ethnicity. The estimate of λ_1 – which reflects the relative intensity of economic concerns – is a little bigger for questions about European versus non-European immigrants, and for people of the same ethnicity than for those of different ethnicity. One explanation for this pattern is that respondents perceive Europeans and immigrants of the same ethnicity as potential substitutes for their labor services, whereas non-Europeans and those of a different ethnicity as viewed as potential complements. The estimates of λ_2 – which reflect the relative intensity of compositional concerns – follow a very different pattern, being lower for people from rich countries (and for those of the same ethnicity), and higher for people from poor countries (and for those of a different ethnicity).

As shown in columns 3-8 of Table 3, differences in the intensity of economic concerns explain a relatively modest share (10-20%) of the age and education gaps in average opinions about admission of different groups. Differences in the intensity of concern over compositional effects play a larger role, explaining 50% of the differential between high- and low educated respondents in views about admitting people from rich European countries but 90% or more of the gap in views about admitting people from poorer countries or those of a different ethnicity.

V. Robustness Checks and Extensions

a. Varying the Indicator Questions

The identification of our structural model is predicated on the *a priori* link between the latent factors and the indicator questions. We have estimated a number of alternative specifications in which we add or subtract questions from the set that are associated with each factor. In this section we briefly summarize two examples. First, we consider adding a sixth question on immigration and crime to the set of indicators of concern over compositional amenities. Crime is a "hot button" issue that is often raised by critics of immigration, and as we noted in the discussion of Table 3, responses on the question of whether immigration makes crime better or worse are fairly high correlated with our the indicators of compositional concern. Second, we consider removing the question on whether immigrants fill job vacancies from the set of indicators of economic concerns. Responses to this question are more favorable (i.e., pro-immigrant) than responses to the other economic indicators and are also noticeably less related to opinions on immigration policy (see Table 3).

Table 6a summarizes the estimation results for the specification that adds the question on crime as a sixth indicator of compositional concerns. This addition leads to a larger estimate of λ_2 and a smaller estimate of λ_1 for all three outcome variables in the table. For the immigration policy question (column 1) and the quality of life measure (column 3) compositional concerns are now about 9-10 times more important than economic concerns in explaining within-group variation in attitudes. For the "good or bad for the economy" question (column 2) the relative size of f λ_2 is also increased relative to the baseline specification, though the change is small. When concerns over

crime are included as an indicator of compositional concerns, this factor also explains a somewhat larger share of the variation in average responses by age, education, employment status, or city size.

Table 6b summarizes the results when we remove the "weakest" indicator of economic concerns, which asks to what extent immigrants fill job vacancies. This change leads to estimates that are very close to our baseline model, although for all three outcomes the relative importance of economic concerns falls slightly. Similar findings emerge when we evaluate the effect of removing other indicator questions. In each case we obtain estimates that are relatively close to those from our baseline model, with similar magnitudes for the key factor loading parameters λ_1 and λ_2.

We have also estimated variants of the model in which one (or more) of the indicator questions is allowed to reflect both economic and compositional concerns.[21] In one case, for example, we allowed the question on whether "immigrants take out more than they put in" to depend on both economic and compositional concerns. This specification led to estimates of λ_1 and λ_2 that are not too different from those in our baseline model, though again the relative importance of compositional concerns was slightly higher. All in all we believe the estimates reported for our baseline model are broadly representative of the range of results from alternative specifications of the indicator variables.

b. Alternative Assumptions on the c-vector

[21] Formally, this change replaces equations (3a) and (3b) with a more general specification: $z_{ji} = M_{1j} f_{1i} + M_{2j} f_{2i} + c_j X_i + v_{ji}$. Provided that there are enough indicators that only depend on f_{1i}, and that only depend on f_{2i}, the model remains identified.

The interpretation of the way economic and compositional concerns affect attitude to immigration policy, and how immigrants affect the economy and the wider society has been conditional on observed characteristics, or within demographic groups. As discussed in Section II, we have to restrict the way that the X's affect the indicator questions (i.e., the c vectors in equations 3a and 3b) in order to separately identify the contributions of economic and compositional concerns in explaining differences in average opinions across demographic groups. Our baseline model imposes the rather strict assumption that $c_j = 0$ for all j. Table 7 compares the implications of this choice to two alternatives: $c_j = c$ for all j (i.e., a single c vector) and $c_j = c^E$ for all 5 indicators of economic concern, $c_j = c^A$ for all 5 indicators of compositional concerns (i.e., factor-specific c-vectors).[22] Comparisons across the columns of Table 7 suggest that the alternative choices lead to similar qualitative conclusions about the relative importance of economic and compositional concerns in explaining views about admitting more or less immigrants. Irrespective of the assumptions on the c-vectors, our model implies that most of the differences in average opinions by age, education, employment status, and city size are driven by differences in compositional concerns. We have also compared the decompositions of mean responses for the country-group specific questions and for the two summary questions, and found that the qualitative conclusions are invariant to the specification of the c-vector. Mean differences across groups in response to the "better or worse for the economy" question are largely attributable to differences in economic concerns, while differences in response to the question "do immigrants make this a better or worse place to live" are mainly attributed to differences in compositional concerns.

[22] Note that alternative assumptions on c_j have no effect on the estimates of λ_1, λ_2, or σ_{12}: in all three cases these are the same as in Table 4.

c. Three Factor Model

Our baseline model assumes that respondents answer questions about immigration policy from a purely self-interested perspective, giving no weight to the welfare of potential immigrants. To evaluate the potential limitations of this view we developed an extended 3-factor model that includes a third "altruistic" channel. We use the three questions described at the bottom of Table 3 as indicators of respondents' altruistic concerns. These questions ask whether respondents think immigration is good or bad for the sending country; whether rich countries have a responsibility to accept migrants; and whether they agree or disagree that free mobility benefits all countries (i.e., both sending and receiving nations).

Estimation results for this model are summarized in Table 8. The estimates of the loading factors λ_1 and λ_2 are not too different from our baseline model, although in the case of the immigration policy question (column 1) the altruism factor appears to pick up some of the variation that was attributed to compositional concerns in our 2-factor model. For the overall assessment questions (columns 2 and 3) the estimates of λ_3 are statistically different than 0 but of a relatively small magnitude. The estimated correlations of the three latent factors are all relatively large and positive.

Interestingly, the addition of altruistic concerns does not change our conclusion about the relative importance of economic and compositional concerns in explaining differences in views across groups. The decompositions in Table 8 suggest that compositional concerns account for 60% or more of the gaps across age and education groups, whereas economic concerns account for no more than 13%.

d. Fitting the Model by Country

Up to this point we have pooled responses to the ESS survey from each of the 21 countries, adding a set of country dummy variables to the vector X to adjust for differences across countries. Arguably, however, there are such wide differences across European countries in the historical context of immigration, and in the salience of economic and compositional concerns, that the full set of parameters in our model may vary across countries. As a final robustness check we therefore estimated our baseline model separately for each country. The results are summarized in Table 9, where we show the estimates of the key parameters λ_1 and λ_2 for each country, along with the shares of the age and education gaps in average opinions about whether more or less immigrants should be admitted that are attributable to economic and compositional concerns.

The estimates of λ_1 and λ_2 for the individual countries suggest that in nearly all European countries, compositional concerns outweigh economic concerns in mediating opinions about immigration policy. In three countries – Austria, Spain, and France – the estimate of λ_1 is actually slightly negative while in 8 others the estimate is positive but relatively small and insignificantly different from 0. In contrast the estimates of λ_2 are all positive and significant, with a range of point estimates from 0.053 to 0.156.[23] The sole exception to the tendency for the estimate of λ_2 to exceed the estimate of λ_1 is Poland.[24]

Reflecting the relative magnitudes of the estimates of λ_1 and λ_2, the

[23] Although not reported in the table, the estimates of the correlation between the latent factors are all in the range of 0.70 to 0.90.

[24] The parameter estimates for Luxembourg are not reported in Table 9. The estimates for λ_1 and λ_2 for Luxembourg are -0.74 (standard error = 1.54) and 0.87 (1.54) respectively. The sample of respondents with useable data from Luxembourg is very small (n=553).

decompositions of the age and education gaps in opinions about immigration policy in columns 3-8 of Table 9 suggest that compositional concerns are typically more important than economic concerns in explaining the more negative opinions of older (over age 60) versus younger (under age 30) respondents, and likewise in explaining the more positive opinions of highly educated (at least some tertiary education) versus poorly educated (only primary schooling) respondents. The relative importance of compositional concerns in explaining the education gaps in different countries is illustrated in Figure 2, which plots the education gap in compositional concerns in each country against the raw education gap for that country. The scatter of points suggests that a very strong relationship between the total gap and the share attributable to compositional concerns.

We also examined the relative importance of economic and compositional concerns in explaining responses to the two overall assessment questions. Consistent with our findings for the pooled sample, in nearly all countries economic concerns are the dominant channel influencing views about whether immigrants are "*good or bad for the economy"* whereas compositional concerns are the dominant channel influencing views about whether immigrants make the country *" a better or worse place to live*".[25] As in Table 9, the estimates of λ_1 and λ_2 for the two overall assessment questions are relatively tightly distributed around the corresponding point estimates from the pooled model, suggesting that the pooled estimates are a good summary of the "average" importance of the channels in different countries.

VI. Discussion and Conclusion

[25] Luxembourg generates poorly identified (and rather large) estimates for λ_1 and λ_2 for these outcomes too.

Why is the general public more favorably inclined to free trade than the liberalization of immigration policy? In standard trade models, the two policies are effectively substitutes. But these models fail to take into account the value that people place on compositional amenities. Immigration, unlike trade, changes the composition of the receiving country's population: its habits, culture, and religion. A large body of economic research has shown that concerns over the characteristics of neighbors, schoolmates, and co-workers play a role in decision-making over what neighborhood to live in; what schools to attend; which city to live in; and which employees to hire. In this paper we argue that similar concerns play an important part in mediating views about immigration policy.

Using a set of questions explicitly designed for the 2002 European Social Survey we estimate a simple structural model that assumes that people care about both the "conventional" economic effects of immigration (on their wages, taxes, and benefits) and the compositional effects on their neighborhoods, schools, and workplaces. Our empirical results confirm that both concerns are important, though compositional concerns are significantly more important in understanding the variation in attitudes toward immigration policy. For example, 70% of the gap between the most- and least-educated respondents in the ESS on the issue of whether immigration should be increased or reduced is attributable to differences in the intensity of concern over compositional amenities, while differences in economic concerns account for 10-15%. Differences in compositional concerns also explain most of the differences in attitudes between older and younger respondents. The age gap is a particular puzzle for models of immigration

preferences that ignore compositional amenities, because many older people are retired, and face a much lower threat of labor market competition than young people.

While our inferences are based on purely observational data, and rely on a restrictive structural model, we present a number of robustness checks and extensions that support our general conclusions about the importance of compositional concerns. Importantly, however, we also show that economic concerns explain a very high share of the variation in attitudes to a question about whether immigration is "*good or bad for the economy*". Respondents appear to distinguish between the conventional economic effects of immigration on relative wages and fiscal balances, and the effects on compositional amenities, and place a relatively high weight on the compositional effects in deciding their views about immigration policy.

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Table 1: Distributions of Responses to Summary Views on Immigration

Panel A: Whether to Allow Many/Some/Few or None of Different Immigrant Groups

	Mean[a]	Standard Deviation	Percentage Distribution of Preferred Share Allowed to Immigrate: None	Few	Some	Many
	(1)	(2)	(3)	(4)	(5)	(6)
People from Rich European Countries	2.62	0.85	9.9	32.6	43.3	14.2
People from Poor European Countries	2.57	0.81	9.0	36.8	42.8	11.4
People from Rich non-European Countries	2.53	0.84	11.3	36.2	41.1	11.4
People from Poor non-European Countries	2.49	0.82	10.8	39.0	40.1	10.0
People of the Same Race/Ethnicity as the Majority	2.73	0.80	6.3	30.8	47.1	15.8
People of a Different Race/Ethnicity as the Majority	2.48	0.82	11.3	38.9	40.0	9.7

Notes: sample size ranges from 37,778 to 38,087 depending on question. Don't know responses are assigned to "some" category.

[a]None response=1, few=2, some=3, many=4.

Panel B: Overall Assessments of the Effect of Immigration

	Mean[a]	Standard Deviation	Percentage Distribution of Responses: 0-11 Scale 0-1	2-4	5	6-8	9-10
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Immigration is Good/Bad for the Economy	4.97	2.36	9.3	25.0	28.1	32.0	5.5
Immigrants Make the Country a Better/Worse Place	4.77	2.18	8.3	28.1	34.6	24.8	4.3

Notes: sample sizes are 37,405 for the economy question and 37,823 for the country question. Don't know responses are assigned to category 5.

[a]Make worse response=0, make better response=10.

Table 2: Simple Correlations of Standardized Responses to Views on Immigration

	Correlation with Variable Number: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Allow people from rich European countries to come	1.00							
2. Allow people from poor European countries to come	0.63 *0.59*	1.00						
3. Allow people from rich non-European countries to come	0.82 *0.8*	0.65 *0.61*	1.00					
4. Allow people from poor non-European countries to come	0.60 *0.55*	0.87 *0.84*	0.68 *0.64*	1.00				
5. Allow people of the same ethnicity to come	0.61 *0.58*	0.80 *0.77*	0.66 *0.62*	0.81 *0.78*	1.00			
6. Allow people of different ethnicity to come	0.64 *0.6*	0.72 *0.69*	0.62 *0.58*	0.69 0.65	0.73 *0.7*	1.00		
7. Immigration is good/bad for the economy	0.33 *0.29*	0.41 *0.37*	0.35 *0.31*	0.41 *0.37*	0.42 *0.38*	0.37 *0.33*	1.00	
8. Immigrants make the country a better/worse place to live	0.33 *0.26*	0.44 *0.37*	0.35 *0.29*	0.45 *0.36*	0.46 *0.39*	0.39 *0.32*	0.57 *0.53*	1.00

Note: main entries are unweighted correlations of standardized responses to 8 questions across all respondents in 2002 ESS. Entries in Italics are adjusted correlations, based on residuals from regressions on country dummies and observed covariates. Orginal 4-point or 11-point responses are linearly re-scaled to lie between 0 (most negative response) and 1 (most positive).

Table 3: Responses to Indicator Questions and Correlations with Summary Views on Immigration

		Correlation of Indicator with Summary Views		
	Mean of Standardized Response[a]	Allow Many/None Average of 4 Country-Groups	Immigration Good or Bad for the Economy	Immigrants Make Country Better/Worse Place to Live
	(1)	(2)	(3)	(4)
Indicators of Economic Concerns:				
Wages are brought down by immigrants (5 point agree/disagree; agree=0)	0.49	0.33	0.34	0.35
Immigrants harm the prospects of the poor (5 point agree/disagree; agree=0)	0.43	0.35	0.37	0.37
Immigrants fill jobs where there are shortages (5 point agree/disagree, disagree=0)	0.63	0.17	0.26	0.19
Immigrants take away jobs/create jobs (11 point numerical scale, take away=0)	0.45	0.36	0.52	0.47
Immigrants take out more/less than they put in (11 point numerical scale; take out more=0)	0.42	0.32	0.52	0.45
Indicators of Compositional Amenity Concerns:				
It is better to have common customs/traditions (5 point agree/disagree; agree=0)	0.41	0.33	0.31	0.35
It is better to have a variety of religions (5 point agree/disagree, disagree=0)	0.51	0.25	0.25	0.29
It is better to have a common language (5 point agree/disagree; agree=0)	0.17	0.10	0.08	0.12
Immigrants undermine/enrich cultural life (11 point numerical scale; undermine=0)	0.58	0.42	0.56	0.61
Stop immigration to reduce social tensions (5 point agree/disagree; agree=0)	0.47	0.46	0.43	0.45
Extra indicator: Immigrants make crime worse/better (11 point numerical scale; worse=0)	0.31	0.31	0.38	0.45
Indicators of Altruistic Concerns:				
Immigration has good/bad effect on sending country (11 point numerical scale; bad effect=0)	0.44	-0.02	0.05	0.03
Rich countries have a responsibility to accept imms. (5 point agree/disagree, disagree=0)	0.60	0.23	0.20	0.24
All countries benefit from free mobility (5 point agree/disagree; agree=0)	0.68	0.14	0.14	0.12

Notes: sample sizes range from 37,244 to 39,149. Entries in columns 2-4 are correlations of standardized indicator with standardized responses to views on immigration (also scaled between 0 and 1).

[a]Original 5 point or 11 point responses are linearly rescaled to lie between 0 (most negative response) and 1 (most positive).

Table 4: Summary of Estimates from Baseline Model

	Dependent Variable (y):		
	Allow Many/None (Average of 4 Country-Groups) (1)	Immigration Good or Bad for the Economy (2)	Immigrants Make Country Better/Worse Place to Live (3)
1. Estimates of λ:			
a. λ_1 = effect of economic concerns on y	0.025	0.120	0.047
	(0.004)	(0.004)	(0.003)
b. λ_2 = effect of compositional concerns on y	0.102	0.038	0.100
	(0.004)	(0.003)	(0.003)
2. Correlation of economic/compositional factors	0.784	0.784	0.784
3. Decomposition of Age Gap (old vs. young)			
a. Total estimated gap	-0.070	-0.020	-0.043
b. Gap attributed to economic concerns	-0.006	-0.026	-0.010
c. Gap attributed to compositional concerns	-0.048	-0.018	-0.048
4. Decomposition of Education Gap (tertiary vs. primary)			
a. Total estimated gap	0.131	0.120	0.098
b. Gap attributed to economic concerns	0.019	0.088	0.034
c. Gap attributed to compositional concerns	0.094	0.035	0.092
5. Decomposition of Unemp. Gap (unemp. vs. employed)			
a. Total estimated gap	-0.029	-0.035	-0.029
b. Gap attributed to economic concerns	-0.009	-0.040	-0.016
c. Gap attributed to compositional concerns	-0.015	-0.005	-0.014
6. Decomposition of Urban Gap (large city vs. rural)			
a. Total estimated gap	0.026	0.028	0.022
b. Gap attributed to economic concerns	0.002	0.011	0.004
c. Gap attributed to compositional concerns	0.020	0.008	0.020

Notes: estimated by minimim distance on reduced form coefficients and residual variance-covariance matrix (see text). Standard errors in parentheses.

Table 5: Explaining Variation in Attitudes toward Different Potential Immigrant Groups

	Estimates of λ:		Age Gap: (old v. young)			Education Gap (tertiary v. primary)		
	Economic	Composition		Explained by:			Explained by:	
	λ_1	λ_2	Actual	Economic	Composition	Actual	Economic	Composition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
By Country of Origin:								
Average of 4 Country Groups	0.025	0.102	-0.070	-0.006	-0.048	0.131	0.019	0.094
	(0.004)	(0.004)		8.6%	68.6%		14.5%	71.9%
People from Rich European Countries	0.028	0.079	-0.050	-0.006	-0.038	0.147	0.020	0.073
	(0.004)	(0.004)		12.0%	76.0%		13.6%	49.7%
People from Poor European Countries	0.029	0.111	-0.080	-0.006	-0.053	0.116	0.021	0.102
	(0.004)	(0.004)		7.5%	66.3%		18.1%	87.9%
People from Rich non-European Countries	0.022	0.095	-0.063	-0.005	-0.045	0.144	0.016	0.087
	(0.004)	(0.004)		7.9%	71.4%		11.1%	60.4%
People from Poor non-European Countries	0.023	0.124	-0.089	-0.005	-0.059	0.116	0.017	0.113
	(0.004)	(0.004)		5.6%	66.3%		14.7%	97.4%
By Ethnicity:								
People of Same Ethnicity	0.035	0.085	-0.067	-0.008	-0.040	0.129	0.025	0.078
	(0.004)	(0.004)		11.9%	59.7%		19.4%	60.5%
People of Different Ethnicity	0.014	0.135	-0.094	-0.003	-0.064	0.136	0.010	0.123
	(0.004)	(0.004)		3.2%	68.1%		7.4%	90.4%

Notes: Based on estimates from baseline model summarized in Table 4 with alternative dependent variables. Dependent variable in each row is rescaled response to question of whether many, some, few, or no immigrants from indicated source group should be allowed to come to live in the respondent's country. Standard errors in parentheses. Percentages below the explained gaps represent shares of the actual gap explained by the factor.

Table 6a: Summary of Estimates from Variant of Baseline Model (Add Crime as Indicator)

	Dependent Variable (y):		
	Allow Many/None (Average of 4 Country-Groups) (1)	Immigration Good or Bad for the Economy (2)	Immigrants Make Country Better/Worse Place to Live (2)
1. Estimates of λ:			
a. λ_1 = effect of economic concerns on y	0.011	0.116	0.015
	(0.004)	(0.004)	(0.004)
b. λ_2 = effect of compositional concerns on y	0.113	0.042	0.133
	(0.004)	(0.004)	(0.004)
2. Correlation of economic/compositional factors	0.832	0.832	0.832
3. Decomposition of Age Gap (old vs. young)			
a. Total estimated gap	-0.070	-0.020	-0.043
b. Gap attributed to economic concerns	-0.002	-0.025	-0.002
c. Gap attributed to compositional concerns	-0.054	-0.020	-0.064
4. Decomposition of Education Gap (tertiary vs. primary)			
a. Total estimated gap	0.131	0.120	0.098
b. Gap attributed to economic concerns	0.008	0.086	0.011
c. Gap attributed to compositional concerns	0.098	0.036	0.115
5. Decomposition of Unemp. Gap (unemp. vs. employed)			
a. Total estimated gap	-0.029	-0.035	-0.029
b. Gap attributed to economic concerns	-0.004	-0.039	-0.005
c. Gap attributed to compositional concerns	-0.018	-0.007	-0.021
6. Decomposition of Urban Gap (large city vs. rural)			
a. Total estimated gap	0.026	0.028	0.022
b. Gap attributed to economic concerns	0.001	0.010	0.001
c. Gap attributed to compositional concerns	0.022	0.008	0.026

Notes: estimated by minimim distance on reduced form coefficients and residual variance-covariance matrix (see text). Standard errors in parentheses. This variant includes an extra indicator variable for compositional concerns, based on whether the respondent thinks immigrants increase crime problems.

Table 6b: Summary of Estimates from Variant of Baseline Model (Remove "Fill Jobs" Indicator)

	Dependent Variable (y):		
	Allow Many/None (Average of 4 Country-Groups) (1)	Immigration Good or Bad for the Economy (2)	Immigrants Make Country Better/Worse Place to Live (2)
1. Estimates of λ:			
a. λ_1 = effect of economic concerns on y	0.021	0.110	0.044
	(0.003)	(0.003)	(0.003)
b. λ_2 = effect of compositional concerns on y	0.106	0.047	0.103
	(0.003)	(0.003)	(0.003)
2. Correlation of economic/compositional factors	0.776	0.776	0.776
3. Decomposition of Age Gap (old vs. young)			
a. Total estimated gap	-0.070	-0.020	-0.043
b. Gap attributed to economic concerns	-0.005	-0.027	-0.011
c. Gap attributed to compositional concerns	-0.050	-0.022	-0.049
4. Decomposition of Education Gap (tertiary vs. primary)			
a. Total estimated gap	0.131	0.120	0.098
b. Gap attributed to economic concerns	0.016	0.080	0.031
c. Gap attributed to compositional concerns	0.097	0.042	0.094
5. Decomposition of Unemp. Gap (unemp. vs. employed)			
a. Total estimated gap	-0.029	-0.035	-0.029
b. Gap attributed to economic concerns	-0.007	-0.036	-0.014
c. Gap attributed to compositional concerns	-0.015	-0.007	-0.015
6. Decomposition of Urban Gap (large city vs. rural)			
a. Total estimated gap	0.026	0.028	0.022
b. Gap attributed to economic concerns	0.002	0.009	0.004
c. Gap attributed to compositional concerns	0.021	0.009	0.021

Notes: estimated by minimim distance on reduced form coefficients and residual variance-covariance matrix (see text). Standard errors in parentheses. This variant excludes the question on whether immigrants fill jobs where there are vacancies as an indicator of economic concerns.

Table 7: Decompositions of Views on Immigration Policy Under Alternative Assumptions on c-coefficients

	Assumption on c-vector		
	c_j=0 (baseline) (1)	Single c vector (2)	Factor-specific c-vector (3)
1. Decomposition of Age Gap (old vs. young)			
a. Total estimated gap	-0.070	-0.070	-0.070
b. Gap attributed to economic concerns	-0.006	-0.010	-0.020
c. Gap attributed to compositional concerns	-0.048	-0.067	-0.044
2. Decomposition of Education Gap (tertiary vs. primary)			
a. Total estimated gap	0.131	0.131	0.131
b. Gap attributed to economic concerns	0.019	0.026	0.015
c. Gap attributed to compositional concerns	0.094	0.122	0.147
3. Decomposition of Unemp. Gap (unemp. vs. employed)			
a. Total estimated gap	-0.029	-0.029	-0.029
b. Gap attributed to economic concerns	-0.009	-0.009	-0.006
c. Gap attributed to compositional concerns	-0.015	-0.015	-0.022
4. Decomposition of Urban Gap (large city vs. rural)			
a. Total estimated gap	0.026	0.026	0.026
b. Gap attributed to economic concerns	0.002	0.002	0.000
c. Gap attributed to compositional concerns	0.020	0.019	0.025

Notes: estimated by minimim distance on reduced form coefficients and residual variance-covariance matrix (see text). Standard errors in parentheses. Estimates of λ_1, λ_2 , and σ_{12} are the same as in Table 4. Specification in column 1 sets all c-vectors to 0. Specification in column 2 assumes c_j=c (a single vector for all 10 indicators). Specification in column 3 assumes $c_j=c^e$ for the 5 indicators of economic concerns, and $c_j=c^a$ for the 5 indicators of compositional concerns (i.e., factor-specific c-vectors).

Table 8: Summary of Estimates from Three Factor Model

	Dependent Variable (y):		
	Allow Many/None (Average of 4 Country-Groups) (1)	Immigration Good or Bad for the Economy (2)	Immigrants Make Country Better/Worse Place to Live (2)
1. Estimates of λ:			
a. λ_1 = effect of economic concerns on y	0.023	0.122	0.047
	(0.004)	(0.004)	(0.003)
b. λ_2 = effect of compositional concerns on y	0.088	0.034	0.096
	(0.004)	(0.004)	(0.003)
c. λ_3 = effect of altruism concerns on y	0.034	0.005	0.010
	(0.004)	(0.002)	(0.002)
2. Correlations of 3 factors			
a. correlation of economic/compostion factors	0.787	0.787	0.787
b. correlation of economic/altruism factors	0.403	0.403	0.403
c. correlation of altruism/composition factors	0.471	0.471	0.471
3. Decomposition of Age Gap (old vs. young)			
a. Total estimated gap	-0.070	-0.020	-0.043
b. Gap attributed to economic concerns	-0.005	-0.026	-0.010
c. Gap attributed to compositional concerns	-0.042	-0.016	-0.045
d. Gap attributed to altruism concerns	0.005	0.001	0.002
4. Decomposition of Education Gap (tertiary vs. primary)			
a. Total estimated gap	0.131	0.120	0.098
b. Gap attributed to economic concerns	0.017	0.089	0.034
c. Gap attributed to compositional concerns	0.081	0.032	0.088
d. Gap attributed to altruism concerns	0.003	0.001	0.010
5. Decomposition of Unemp. Gap (unemp. vs. employed)			
a. Total estimated gap	-0.029	-0.035	-0.029
b. Gap attributed to economic concerns	-0.008	-0.041	-0.016
c. Gap attributed to compositional concerns	-0.013	-0.005	-0.014
d. Gap attributed to altruism concerns	0.001	0.000	0.000
6. Decomposition of Urban Gap (large city vs. rural)			
a. Total estimated gap	0.026	0.028	0.022
b. Gap attributed to economic concerns	0.002	0.012	0.004
c. Gap attributed to compositional concerns	0.018	0.007	0.019
d. Gap attributed to altruism concerns	0.002	0.000	0.001

Notes: estimated by minimim distance on reduced form coefficients and residual variance-covariance matrix (see text). Standard errors in parentheses.

Table 9: Summary of Estimates of Baseline Model, Estimated by Country

	Estimates of λ:		Age Gap: (old v. young)			Education Gap (tertiary v. primary)		
	Economic	Composition		Explained by:			Explained by:	
	λ_1	λ_2	Actual	Economic	Composition	Actual	Economic	Composition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Austria	-0.001	0.109	-0.127	0.000	-0.037	0.129	-0.003	0.142
	(0.017)	(0.016)						
Belgium	0.010	0.120	-0.026	-0.006	-0.112	0.197	0.009	0.167
	(0.014)	(0.014)						
Switzerland	0.007	0.105	-0.081	-0.003	-0.047	0.133	0.005	0.072
	(0.012)	(0.012)						
Czech Republic	0.044	0.094	-0.080	-0.029	-0.083	0.126	0.044	0.090
	(0.021)	(0.022)						
Germany	0.047	0.088	-0.115	-0.034	-0.080	0.126	0.044	0.077
	(0.001)	(0.011)						
Denmark	0.011	0.105	-0.035	-0.002	-0.084	0.173	0.011	0.145
	(0.016)	(0.015)						
Spain	-0.012	0.154	-0.024	0.002	-0.069	0.087	-0.006	0.083
	(0.021)	(0.022)						
Finland	0.037	0.093	-0.038	-0.004	-0.034	0.102	0.044	0.148
	(0.013)	(0.014)						
France	-0.029	0.156	-0.122	0.009	-0.098	0.144	-0.019	0.141
	(0.026)	(0.026)						
United Kingdom	0.050	0.097	-0.084	0.000	-0.043	0.180	0.066	0.141
	(0.013)	(0.013)						
Greece	0.021	0.089	-0.051	0.005	0.010	0.087	0.015	0.059
	(0.021)	(0.022)						
Hungary	0.038	0.057	-0.025	-0.016	-0.035	0.069	0.032	0.061
	(0.016)	(0.016)						
Ireland	0.043	0.082	-0.040	-0.022	-0.022	0.118	0.057	0.130
	(0.015)	(0.015)						
Italy	0.035	0.113	-0.048	0.013	-0.015	0.169	0.028	0.103
	(0.018)	(0.018)						
Netherlands	0.036	0.078	-0.030	-0.019	-0.065	0.129	0.045	0.115
	(0.014)	(0.014)						
Norway	0.017	0.095	-0.093	0.000	-0.039	0.147	0.023	0.138
	(0.013)	(0.012)						
Poland	0.063	0.053	-0.069	-0.032	-0.047	0.119	0.051	0.045
	(0.015)	(0.015)						
Portugal	0.019	0.126	0.000	0.000	-0.038	0.150	0.012	0.131
	(0.026)	(0.026)						
Sweden	0.022	0.099	-0.041	-0.016	-0.107	0.116	0.033	0.160
	(0.014)	(0.013)						
Slovenia	0.023	0.103	-0.121	-0.026	-0.170	0.116	0.026	0.139
	(0.019)	(0.019)						

Notes: See notes to Tables 4 and 5. Standard errrors in parentheses. Estimates for Luxembourg not reported: see text.

Figure 1: Cross-Country Correlation in Two Assessments of the Effect of Immigration

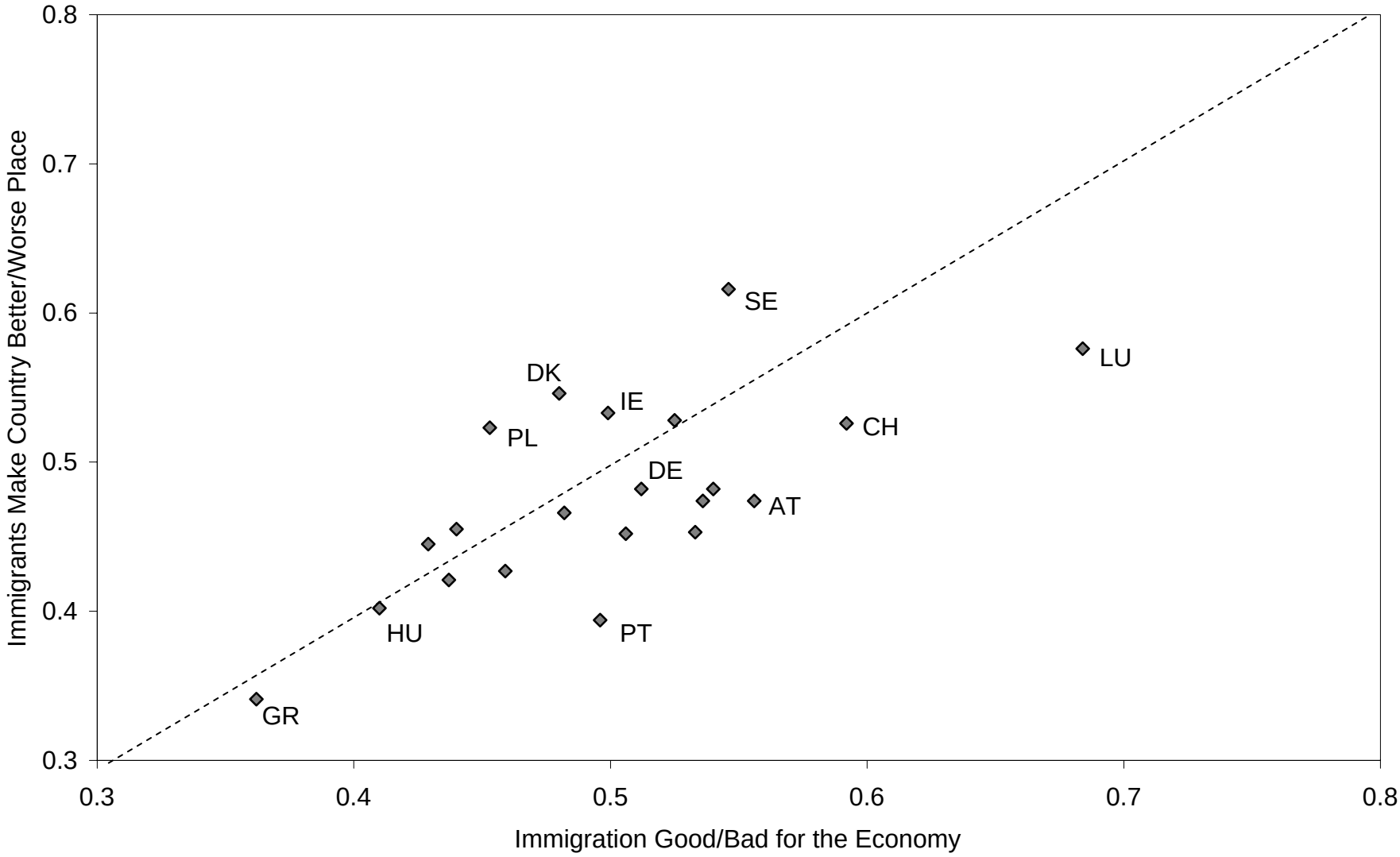
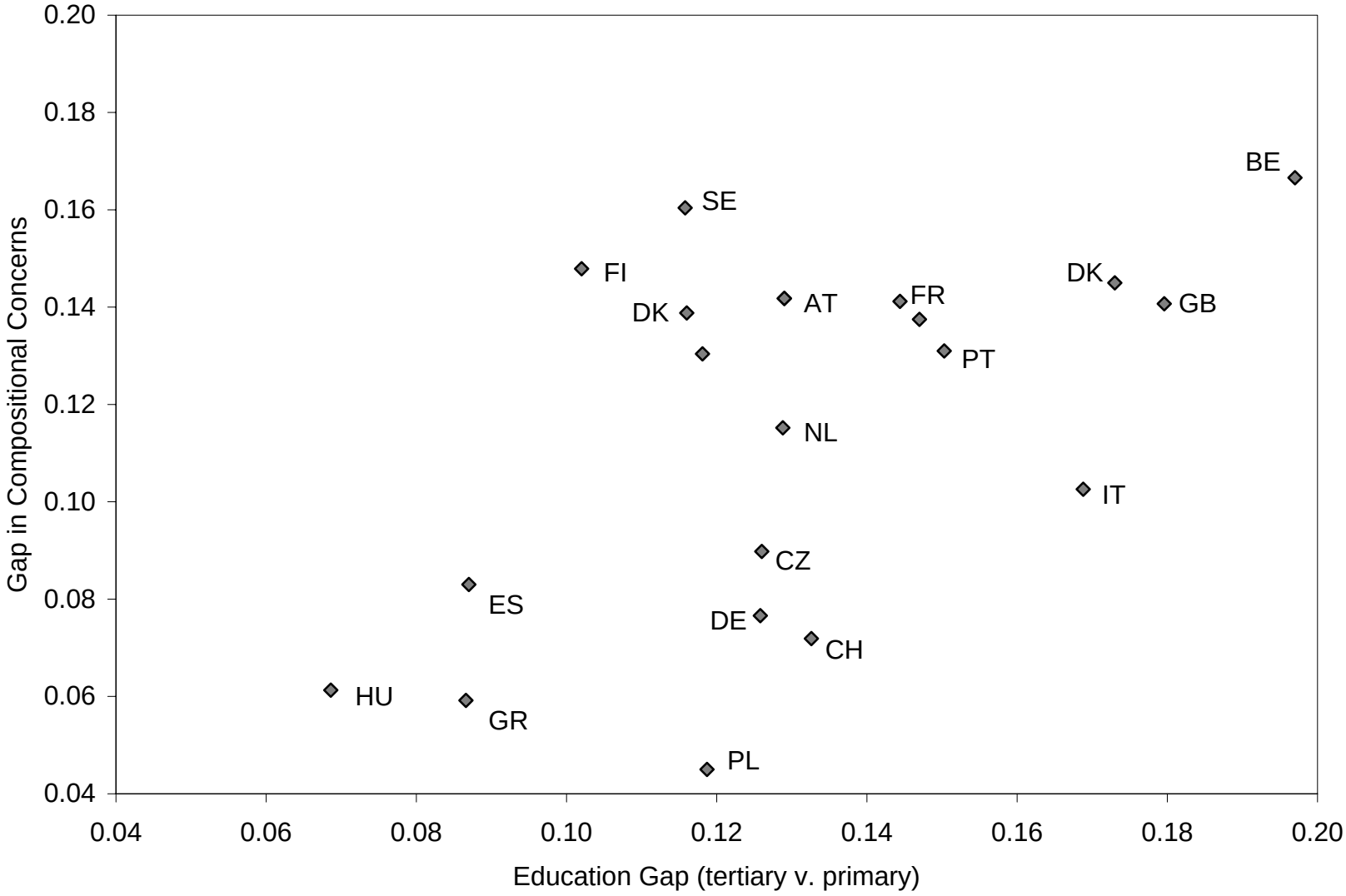


Figure 2: Share of Educ. Gap in Immigration Policy Question Attributed to Compostional Concerns



Appendix Table 1: Characteristics of 2002 ESS Sample by Country

	Sample Size		Age Distribution (%)			Ethnicity (%)		Empl. Status (%)		In Larger	Education (%)	
	(1)	Male (%) (2)	Under 30 (3)	30-54 (4)	Over 54 (5)	Minority (6)	Immigrant (7)	Employed (8)	Retired (9)	City (%) (10)	Primary (11)	Tertiary (12)
Austria	2,257	46.2	20.0	47.8	32.2	5.7	8.9	55.7	24.8	36.2	31.6	12.7
Belgium	1,899	51.5	28.1	43.4	28.4	2.2	8.3	49.6	17.9	22.8	35.0	13.6
Switzerland	2,040	48.1	16.3	48.6	35.1	4.6	16.9	55.4	17.5	21.1	18.1	16.1
Czech Republic	1,360	47.7	15.9	38.2	45.9	2.2	4.3	46.9	33.5	32.8	15.9	11.1
Germany	2,919	48.2	19.6	45.3	35.1	3.9	7.3	47.0	23.1	33.2	15.5	21.6
Denmark	1,506	50.7	22.0	44.6	33.4	2.5	5.2	59.8	20.4	35.5	24.8	17.2
Spain	1,729	47.3	20.7	40.5	38.8	2.9	4.6	42.3	16.8	30.1	58.7	14.6
Finland	2,000	48.0	26.1	40.6	33.3	1.2	3.2	52.6	24.7	27.9	40.1	24.9
France	1,503	45.2	21.7	42.2	36.1	4.0	10.0	46.7	27.5	36.0	51.7	26.0
United Kingdom	2,052	46.6	18.8	43.1	38.1	6.2	9.3	51.7	24.2	29.5	55.8	23.4
Greece	2,566	43.4	19.4	38.3	42.3	3.7	9.8	40.8	25.2	56.0	57.8	14.0
Hungary	1,685	48.0	24.9	41.4	33.7	5.1	2.4	42.8	22.9	24.9	63.0	13.5
Ireland	2,046	46.1	23.5	43.2	33.4	1.7	7.3	51.6	13.5	32.7	47.0	12.8
Italy	1,207	45.4	22.2	45.1	32.7	1.0	2.2	49.0	18.6	17.6	56.1	8.0
Luxemburg	1,552	47.4	31.8	39.0	29.2	6.8	31.0	40.4	15.9	22.7	46.0	16.7
Netherlands	2,364	44.1	16.0	47.4	36.5	4.2	6.6	46.6	15.3	29.3	42.8	23.3
Norway	2,036	54.2	20.4	48.4	31.2	2.4	6.5	62.6	15.6	35.6	14.9	28.1
Poland	2,110	48.9	32.3	40.8	26.9	2.8	1.5	40.4	23.8	27.4	55.2	14.1
Portugal	1,511	41.7	22.2	39.2	38.6	1.2	6.0	49.8	22.2	41.6	75.1	8.9
Sweden	1,999	50.8	23.3	41.8	34.9	2.9	10.7	58.9	17.1	32.9	47.8	30.6
Slovenia	1,519	47.6	27.8	42.7	29.6	3.0	8.9	39.8	21.0	23.6	30.4	14.1

Notes: unweighted means from 2002 ESS sample. Sample sizes include all valid observations: number of valid responses for specific items vary.

Appendix Table 2: Mean Standardized Responses to Views on Immigration Across Countries

	Allow Many/Some/Few/None of:			Immigration Good or Bad for the Economy	Immigrants Make Country Better/Worse Place to Live
	Average of 4 Country-Groups	People of Same Ethnicity	People of Different Ethnicity		
	(1)	(2)	(3)	(4)	(5)
All Countries	0.52	0.58	0.49	0.50	0.48
Austria	0.46	0.49	0.44	0.56	0.47
Belgium	0.53	0.58	0.50	0.46	0.43
Switzerland	0.60	0.67	0.59	0.59	0.53
Czech Republic	0.53	0.52	0.46	0.44	0.42
Germany	0.55	0.63	0.53	0.51	0.48
Denmark	0.56	0.65	0.51	0.48	0.55
Spain	0.54	0.56	0.53	0.54	0.47
Finland	0.49	0.56	0.45	0.53	0.53
France	0.49	0.56	0.50	0.51	0.45
United Kingdom	0.49	0.55	0.47	0.44	0.46
Greece	0.36	0.42	0.31	0.36	0.34
Hungary	0.35	0.54	0.31	0.41	0.40
Ireland	0.57	0.66	0.56	0.50	0.53
Italy	0.59	0.62	0.57	0.53	0.45
Luxemburg	0.50	0.56	0.47	0.68	0.58
Netherlands	0.50	0.55	0.52	0.48	0.47
Norway	0.56	0.63	0.54	0.54	0.48
Poland	0.57	0.59	0.53	0.45	0.52
Portugal	0.43	0.44	0.41	0.50	0.39
Sweden	0.69	0.73	0.69	0.55	0.62
Slovenia	0.55	0.57	0.51	0.43	0.45

Notes: Original 4 point or 11 point responses are linearly rescaled to lie between 0 (most negative response) and 1 (most positive). Entries in column 1 are unweighted averages of rescaled responses for questions on allowing many/some/few/none people from rich European countries, poor European countris, rich non-European countries, and poor non-European countries.

Appendix Table 3a: Decomposition of coefficients of observed characteristics across channels

	Rich European			Poor European			Rich Overseas		
	Total Effect	Economy	Culture	Total Effect	Economy	Culture	Total Effect	Economy	Culture
Age 30-45	-0.019	-0.003	-0.008	-0.040	-0.003	-0.011	-0.019	-0.002	-0.009
	(0.004)	(0.001)	(0.000)	(0.004)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
Age 45-60	-0.033	-0.003	-0.018	-0.054	-0.003	-0.025	-0.042	-0.002	-0.021
	(0.004)	(0.001)	(0.001)	(0.004)	(0.000)	(0.001)	(0.004)	(0.000)	(0.001)
Age 60+	-0.0497	-0.006	-0.038	-0.080	-0.006	-0.053	-0.063	-0.005	-0.045
	(0.006)	(0.001)	(0.002)	(0.006)	(0.000)	(0.002)	(0.006)	(0.001)	(0.002)
Male	0.033	0.000	-0.007	-0.004	0.000	-0.010	0.023	0.000	-0.009
	(0.003)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)
Low Education	-0.048	-0.006	-0.024	-0.033	-0.007	-0.034	-0.048	-0.005	-0.029
	(0.004)	(0.001)	(0.001)	(0.003)	(0.000)	(0.001)	(0.003)	(0.001)	(0.001)
High Education	0.099	0.014	0.048	0.084	0.015	0.068	0.096	0.011	0.058
	(0.004)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)
Unemployment	-0.032	-0.009	-0.011	-0.033	-0.010	-0.016	-0.023	-0.008	-0.014
	(0.009)	(0.001)	(0.001)	(0.009)	(0.001)	(0.001)	(0.009)	(0.001)	(0.001)
Inactive	0.006	0.001	-0.001	0.006	0.001	-0.001	0.004	0.001	-0.001
	(0.004)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
Retired	-0.018	-0.001	-0.006	-0.019	-0.001	-0.008	0.019	0.000	-0.007
	(0.006)	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)
Immigrant	0.053	0.013	0.029	0.054	0.014	0.040	0.046	0.011	0.035
	(0.006)	(0.002)	(0.001)	(0.006)	(0.001)	(0.001)	(0.006)	(0.002)	(0.001)
Minority	0.012	0.005	0.019	0.019	0.005	0.027	0.008	0.004	0.023
	(0.009)	(0.000)	(0.001)	(0.008)	(0.000)	(0.001)	(0.009)	(0.000)	(0.001)
City	0.035	0.003	0.016	0.017	0.003	0.022	0.031	0.002	0.019
	(0.004)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.003)	(0.000)	(0.001)
Town	0.018	0.002	0.008	0.010	0.002	0.011	0.016	0.002	0.009
	(0.004)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)

Notes: estimated by minimum distance on reduced from coefficients and residual variance-covariance matrix (see text). Standard errors in parentheses.

Appendix Table 3b: Decomposition of coefficients of observed characteristics across channels

	Poor Overseas			Different Ethnicity			Same Ethnicity		
	Total Effect	Economy	Culture	Total Effect	Economy	Culture	Total Effect	Economy	Culture
Age 30-45	-0.037	-0.002	-0.012	-0.039	-0.002	-0.013	-0.034	-0.004	-0.008
	(0.004)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
Age 45-60	-0.059	-0.002	-0.028	-0.060	-0.002	-0.030	-0.044	-0.004	-0.019
	(0.004)	(0.000)	(0.001)	(0.004)	(0.000)	(0.001)	(0.004)	(0.000)	(0.001)
Age 60+	-0.088	-0.005	-0.059	-0.094	-0.003	-0.064	-0.067	-0.008	-0.040
	(0.006)	(0.000)	(0.002)	(0.006)	(0.000)	(0.002)	(0.006)	(0.000)	(0.002)
Male	-0.010	0.000	-0.012	-0.003	0.000	-0.013	0.011	0.000	-0.008
	(0.003)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)
Low Education	-0.033	-0.005	-0.038	-0.041	-0.003	-0.041	-0.042	-0.008	-0.026
	(0.003)	(0.000)	(0.001)	(0.003)	(0.000)	(0.001)	(0.003)	(0.000)	(0.001)
High Education	0.083	0.011	0.076	0.095	0.007	0.082	0.087	0.017	0.052
	(0.004)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)
Unemployment	-0.029	-0.008	-0.018	-0.026	-0.005	-0.019	-0.028	-0.012	-0.012
	(0.009)	(0.001)	(0.001)	(0.009)	(0.001)	(0.001)	(0.009)	(0.001)	(0.001)
Inactive	0.004	0.001	-0.001	0.013	0.000	-0.001	0.012	0.001	-0.001
	(0.004)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
Retired	-0.016	0.000	-0.009	-0.014	0.000	-0.010	-0.012	-0.001	-0.006
	(0.006)	(0.000)	(0.001)	(0.006)	(0.000)	(0.001)	(0.006)	(0.000)	(0.000)
Immigrant	0.051	0.011	0.045	0.052	0.007	0.049	0.049	0.017	0.031
	(0.006)	(0.002)	(0.001)	(0.006)	(0.002)	(0.001)	(0.006)	(0.002)	(0.001)
Minority	0.022	0.004	0.030	0.023	0.003	0.033	-0.001	0.006	0.021
	(0.009)	(0.000)	(0.001)	(0.009)	(0.000)	(0.001)	(0.008)	(0.000)	(0.001)
City	0.022	0.002	0.025	0.027	0.001	0.027	0.020	0.003	0.017
	(0.003)	(0.000)	(0.001)	(0.003)	(0.000)	(0.001)	(0.003)	(0.000)	(0.000)
Town	0.013	0.002	0.012	0.012	0.001	0.013	0.011	0.002	0.008
	(0.003)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)

Notes: estimated by minimum distance on reduced from coefficients and residual variance-covariance matrix (see text). Standard errors in parentheses.

Appendix Table 3c: Decomposition of coefficients of observed characteristics across channels

	Good or Bad for the Economy			Worse or better place to live			Allow Many/None (Average of 4 Country Groups)		
	Total Effect	Economy	Culture	Total Effect	Economy	Culture	Total Effect	Economy	Culture
Age 30-45	-0.010	-0.013	-0.004	-0.015	-0.005	-0.010	-0.029	-0.003	-0.010
	(0.003)	(0.000)	(0.000)	(0.003)	(0.0004)	(0.0006)	(0.003)	(0.0004)	(0.0006)
Age 45-60	-0.001	-0.012	-0.009	-0.022	-0.005	-0.022	-0.047	-0.003	-0.023
	(0.004)	(0.000)	(0.000)	(0.003)	(0.0004)	(0.0009)	(0.004)	(0.0004)	(0.001)
Age 60+	-0.020	-0.026	-0.018	-0.043	-0.010	-0.048	-0.070	-0.006	-0.048
	(0.005)	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)	(0.005)	(0.0008)	(0.001)
Male	0.031	0.001	-0.004	0.005	0.001	-0.009	0.010	0.000	-0.010
	(0.002)	(0.000)	(0.000)	(0.002)	(0.0002)	(0.0005)	(0.002)	(0.0001)	(0.0005)
Low Education	-0.042	-0.028	-0.012	-0.031	-0.011	-0.031	-0.041	-0.006	-0.031
	(0.003)	(0.000)	(0.001)	(0.003)	(0.0007)	(0.001)	(0.003)	(0.0008)	(0.001)
High Education	0.078	0.060	0.023	0.067	0.023	0.061	0.090	0.013	0.062
	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.002)
Unemployment	-0.035	-0.040	-0.005	-0.029	-0.016	-0.014	-0.029	-0.009	-0.015
	(0.007)	(0.001)	(0.000)	(0.007)	(0.001)	(0.001)	(0.008)	(0.001)	(0.001)
Inactive	0.011	0.003	0.000	0.002	0.001	-0.001	0.005	0.001	-0.001
	(0.003)	(0.000)	(0.000)	(0.003)	(0.0002)	(0.0005)	(0.003)	(0.0002)	(0.0005)
Retired	0.005	-0.002	-0.003	-0.006	-0.001	-0.007	-0.018	0.000	-0.008
	(0.005)	(0.000)	(0.000)	(0.005)	(0.0003)	(0.0008)	(0.005)	(0.0002)	(0.0008)
Immigrant	0.070	0.058	0.014	0.079	0.023	0.037	0.051	0.012	0.037
	(0.005)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)
Minority	0.029	0.022	0.009	0.032	0.009	0.024	0.015	0.005	0.025
	(0.007)	(0.001)	(0.000)	(0.007)	(0.0007)	(0.001)	(0.008)	(0.0007)	(0.001)
City	0.028	0.011	0.008	0.022	0.004	0.020	0.026	0.002	0.020
	(0.003)	(0.000)	(0.0007)	(0.003)	(0.0004)	(0.0008)	(0.003)	(0.0003)	(0.0008)
Town	0.013	0.008	0.004	0.009	0.003	0.010	0.014	0.002	0.010
	(0.003)	(0.000)	(0.0004)	(0.003)	(0.0003)	(0.0005)	(0.003)	(0.0003)	(0.0006)

Notes: estimated by minimum distance on reduced from coefficients and residual variance-covariance matrix (see text). Standard errors in parentheses.

Appendix A: Estimation Procedures and Identification

In this section we explain in detail how we estimate the parameters of the model. We introduce matrix algebra notation to simplify notation and allow for an arbitrary number of channels.

Let y be the $1 \times N$ vector of policy responses, $\mathbf{z}$ be the $q \times N$ matrix of underlying opinions, $\mathbf{X}$ be the $k \times N$ matrix of covariates and $\mathbf{f}$ be the $p \times N$ matrix of underlying factors. Let μ, $\mathbf{v}$ and $\boldsymbol{\omega}$ be $1 \times N$, $q \times N$ and $p \times N$ matrices of residuals. Model parameters then include a $1 \times p$ vector Λ, a $1 \times k$ vector α, a $q \times p$ matrix $\mathbf{M}$, a $q \times k$ matrix $\mathbf{C}$ and a $1 \times p$ matrix $\mathbf{B}$ such that

(A-1) $y = \Lambda \mathbf{f} + \alpha \mathbf{X} + \mu$

(A-2) $\mathbf{z} = \mathbf{M}\mathbf{f} + \mathbf{C}\mathbf{X} + \mathbf{v}$

(A-3) $\mathbf{f} = \mathbf{B}\mathbf{X} + \boldsymbol{\omega}$

Equation (A-1) corresponds to equation (2), where we have combined λ_1 and λ_2 to form the vector Λ and generalized to allow for p channels. Equations (A-2) and (A-3) corresponds to equations (3-a), (3-b) and (4-a), (4-b) where we have again combined parameters to form appropriate matrices. Note that $\mathbf{M}$ has the special form

(A-4) $$\mathbf{M} = \begin{pmatrix} M_1 & 0 & \dots & 0 \\ 0 & M_2 & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \dots & M_P \end{pmatrix}.$$

To form the reduced form equations (corresponding to equations (5-a) and (5-b) in the text) , we substitute (A-3) into (A-1) and (A-2) to obtain:

(A-5) $y = (\Lambda\mathbf{B} + \alpha)\mathbf{X} + (\mu + \Lambda\boldsymbol{\omega}) = \Gamma_0\mathbf{X} + \varepsilon_0$

(A-6) $\mathbf{z} = \mathbf{(MB + C)X + (v + M}\omega\mathbf{)} = \boldsymbol{\Gamma}_1\mathbf{X} + \boldsymbol{\varepsilon}_1$

and let $\boldsymbol{\varepsilon} = \begin{pmatrix} \varepsilon_0 \\ \boldsymbol{\varepsilon}_1 \end{pmatrix}$ with $\boldsymbol{\Omega} = E(\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}')$.

Stage 1: Estimating the reduced form

We begin by estimating the reduced form coefficients by standard multivariate linear regression to form estimates $\hat{\Gamma}_0 = y\mathbf{X}'(\mathbf{XX}')^{-1}$ and $\hat{\boldsymbol{\Gamma}}_1 = \mathbf{zX}'(\mathbf{XX}')^{-1}$. This allows us to condition out the effects of the variables collected in **X**, and work with the reduced form residuals $\hat{\boldsymbol{\varepsilon}} = \begin{pmatrix} \hat{\varepsilon}_0 \\ \hat{\boldsymbol{\varepsilon}}_1 \end{pmatrix} = \boldsymbol{\varepsilon}\mathbf{P}$, where $\hat{\varepsilon}_0 = y(\mathbf{I} - \mathbf{X}'(\mathbf{XX}')^{-1}\mathbf{X}) = y\mathbf{P} = \varepsilon_0\mathbf{P}$ and

$\hat{\boldsymbol{\varepsilon}}_1 = \mathbf{z}(\mathbf{I} - \mathbf{X}'(\mathbf{XX}')^{-1}\mathbf{X}) = \mathbf{zP} = \boldsymbol{\varepsilon}_1\mathbf{P}$. The variance-covariance matrix $\boldsymbol{\Omega}$ is consistently estimated by $\hat{\boldsymbol{\Omega}} = \frac{1}{N-k}\hat{\boldsymbol{\varepsilon}}\hat{\boldsymbol{\varepsilon}}'$, since $E(\hat{\boldsymbol{\Omega}}) = \frac{1}{N-k}E(\boldsymbol{\varepsilon}\mathbf{P}\boldsymbol{\varepsilon}') = \frac{1}{N-k}E(tr\mathbf{P}\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}') = \boldsymbol{\Omega}$.

Asymptotically the estimates are distributed as

(A-7) $\sqrt{N}\begin{pmatrix} \mathrm{vec}\hat{\boldsymbol{\Gamma}} - \mathrm{vec}\boldsymbol{\Gamma} \\ \mathrm{vec}\hat{\boldsymbol{\Omega}} - \mathrm{vec}\boldsymbol{\Omega} \end{pmatrix} \to N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \boldsymbol{\Omega} \otimes (\mathbf{XX}')^{-1} 0 \\ 0 \qquad\qquad \mathbf{Q} \end{pmatrix}\right) \equiv N(0, \mathbf{V})$,

where $\mathbf{Q}$ is an appropriately defined matrix of fourth order moments.

Stage 2: Estimating the Loading Matrix M and the Channel weightings Λ

We assume that (in accordance with equations (6-a), (6-b) and (6-c)) $\mu, \mathbf{v}$ and $\boldsymbol{\omega}$ are mutually orthogonal so that

$$\text{(A-8)}\quad E\left[\begin{pmatrix}\mu_i\\ \mathbf{v}_i\\ \omega_i\end{pmatrix}\begin{pmatrix}\mu_i\\ \mathbf{v}_i\\ \omega_i\end{pmatrix}'\middle|\mathbf{X}_i\right] = \begin{pmatrix}\sigma_\mu & 0 & 0\\ 0 & \boldsymbol{\varphi} & 0\\ 0 & 0 & \boldsymbol{\Sigma}\end{pmatrix}$$

where $\boldsymbol{\varphi}$ is diagonal and the diagonal elements of $\boldsymbol{\Sigma}$ are all unity. Therefore

$$\text{(A-9)}\quad \boldsymbol{\Omega} = \begin{pmatrix}\Lambda\boldsymbol{\Sigma}\Lambda'+\sigma_\mu & \Lambda\boldsymbol{\Sigma}\mathbf{M}'\\ \mathbf{M}\boldsymbol{\Sigma}\Lambda' & \mathbf{M}\boldsymbol{\Sigma}M'+\varphi\end{pmatrix} = \begin{pmatrix}\boldsymbol{\Omega}_{11} & \boldsymbol{\Omega}_{12}\\ \boldsymbol{\Omega}_{21} & \boldsymbol{\Omega}_{22}\end{pmatrix}.$$

We choose to estimate $\hat{\mathbf{M}}, \hat{\boldsymbol{\Sigma}}, \hat{\boldsymbol{\varphi}}$ by equally weighted minimum distance. That is to say we set the free parameters of $\hat{\mathbf{M}}, \hat{\boldsymbol{\Sigma}}, \hat{\boldsymbol{\varphi}}$ to solve

$$\text{(A-10)}\quad \min v(\hat{\mathbf{M}}\hat{\boldsymbol{\Sigma}}\hat{\mathbf{M}}'+\hat{\boldsymbol{\varphi}}-\hat{\boldsymbol{\Omega}}_{22})'v(\hat{\mathbf{M}}\hat{\boldsymbol{\Sigma}}\hat{\mathbf{M}}'+\hat{\boldsymbol{\varphi}}-\hat{\boldsymbol{\Omega}}_{22})$$

where *v(.)* denotes the operator eliminating the supradiagonal elements from the vectorisation of the argument (applied to avoid duplication of the off-diagonal moment conditions).

Vectorising and totally differentiating the moment conditions

gives $\mathrm{d\,vec}\,\boldsymbol{\Omega}_{22} = [(\mathbf{M}\boldsymbol{\Sigma}\otimes\mathbf{I}_{\mathbf{q}})+(\mathbf{I}_{\mathbf{q}}\otimes\mathbf{M}\boldsymbol{\Sigma})\mathbf{K}_{qq}]\,\mathrm{d\,vec}\,\mathbf{M}+(\mathbf{M}\otimes\mathbf{M})\,\mathrm{d\,vec}\,\boldsymbol{\Sigma}+\mathrm{d\,vec}\,\boldsymbol{\varphi}$

$= \mathbf{G}_M\,\mathrm{dvec}\,\mathbf{M}+\mathbf{G}_\Sigma\mathrm{dvec}\boldsymbol{\Sigma}+\mathbf{I}_{q^2}\mathrm{dvec}\boldsymbol{\varphi}$ where $\mathbf{K}_{qq}$ is an appropriate commutation matrix and this equation defines $\mathbf{G}_M$ and $\mathbf{G}_\Sigma$.

Hence

(A-11) $\mathrm{Var}\begin{pmatrix} \mathrm{vec}\,\hat{\mathbf{M}} \\ \mathrm{vec}\,\hat{\boldsymbol{\Sigma}} \\ \mathrm{vec}\,\hat{\boldsymbol{\varphi}} \end{pmatrix} = \mathbf{G}_1^{+\prime}\mathrm{Var}(\mathrm{vec}\,\boldsymbol{\Omega}_{22})\mathbf{G}_1^{+}$

where $\mathbf{G}_1 = \begin{pmatrix} \mathbf{G}_m' \\ \mathbf{G}_\Sigma' \\ \mathbf{I}_{q^2} \end{pmatrix}$ and $\mathbf{G}_1^{+} = \mathbf{G}_1(\mathbf{G}_1'\mathbf{G}_1)^{-1}$ is the Moore-Penrose inverse.

Having obtained estimates of $\mathbf{M}$ and $\boldsymbol{\Sigma}$, we now estimate Λ by $\hat{\Lambda} = \hat{\boldsymbol{\Omega}}_{12}\hat{\mathbf{M}}^{+}\hat{\boldsymbol{\Sigma}}^{-1}$ where $\hat{\mathbf{M}}^{+} = \hat{\mathbf{M}}(\hat{\mathbf{M}}'\hat{\mathbf{M}})^{-1}$, which amounts again to applying equally weighted minimum distance. Thus, vectorising and totally differentiating the above expression gives

$$\mathrm{d}\,\mathrm{vec}\,\hat{\Lambda} = \mathrm{d}\hat{\Lambda}' = [\hat{\boldsymbol{\Sigma}}^{-1}\hat{\mathbf{M}}^{+\prime}]\mathrm{d}\,\mathrm{vec}\,\hat{\boldsymbol{\Omega}}_{12} + [\hat{\boldsymbol{\Sigma}}^{-1} \otimes \hat{\boldsymbol{\Omega}}_{12}]\mathrm{d}\,\mathrm{vec}\,\hat{\mathbf{M}}^{+} + [\mathbf{I}_q \otimes \hat{\boldsymbol{\Omega}}_{12}\mathbf{M}^{+}]\mathrm{d}\,\mathrm{vec}\,\hat{\boldsymbol{\Sigma}}^{-1},$$

from which, using standard formulae for differentials of inverses, we can form an expression of the form $\mathrm{d}\,\hat{\Lambda}' = \mathbf{H}_{12}\mathrm{d}\,\mathrm{vec}\,\hat{\boldsymbol{\Omega}}_{12} + \mathbf{H}_{\mathbf{M}}\mathrm{d}\,\mathrm{vec}\,\mathbf{M} + \mathbf{H}_{\Sigma}\mathrm{d}\,\mathrm{vec}\,\hat{\boldsymbol{\Sigma}}$ for appropriate $\mathbf{H}_{12}, \mathbf{H}_{\mathbf{M}}$ and $\mathbf{H}_{\Sigma}$.

Thus, letting

$$\mathbf{H}_2 = \begin{pmatrix} \mathbf{H}_{12}' \\ \mathbf{H}_{\mathbf{M}}' \\ \mathbf{H}_{\Sigma}' \\ \mathbf{0} \end{pmatrix} \text{ and } \mathbf{H}_1 = \begin{pmatrix} \mathbf{J}_{12} \\ \mathbf{G}_1^{+}\mathbf{J}_{22} \end{pmatrix}$$

where $\mathbf{J}_{12}$ and $\mathbf{J}_{22}$ pick out the elements of $\boldsymbol{\Omega}_{12}$ and $\boldsymbol{\Omega}_{22}$ in $\mathrm{vec}\,\boldsymbol{\Omega}$,

(A-12) $\mathrm{Var}(\hat{\Lambda}') = \mathbf{H}_2'\mathbf{H}_1'\mathrm{Var}(\mathrm{vec}\boldsymbol{\Omega})\mathbf{H}_1\mathbf{H}_2$.

Stage 3: De-composing Γ_0 across the channels

Consider firstly the case where we assume that $\mathbf{C} = 0$. Then we estimate **B** by

$\widehat{\mathbf{B}} = \hat{\mathbf{M}}^{+\prime}\hat{\mathbf{\Gamma}}_1$ and $\mathrm{d\,vec}\,\hat{\mathbf{B}} = (\hat{\mathbf{\Gamma}}_1' \otimes \mathbf{I}_P)\mathbf{K}_{qp}\,\mathrm{d\,vec}\,\hat{\mathbf{M}}^{+} + (\mathbf{I}_k \otimes \widehat{\mathbf{M}}^{+\prime})\mathrm{d\,vec}\,\widehat{\mathbf{\Gamma}}_1$

$= \mathbf{F}_M\,\mathrm{d\,vec}\,\hat{\mathbf{M}} + \mathbf{F}_r\,\mathrm{d\,vec}\,\mathbf{\Gamma}_1$ for appropriate $\mathbf{F}_M$ and $\mathbf{F}_r$.

Let $\mathbf{F}_2 = \begin{pmatrix} \mathbf{F}_r & \mathbf{0} & \mathbf{F}_m & \mathbf{0}\ \mathbf{0} \\ \mathbf{0} & \mathbf{H}_{22} & \mathbf{H}_m & \mathbf{H}_\Sigma\ \mathbf{0} \end{pmatrix}$ and $\mathbf{F}_1 = \begin{pmatrix} \mathbf{J}_1 & \mathbf{0} \\ \mathbf{0} & \mathbf{J}_{12} \\ \mathbf{0} & \mathbf{G}_1^{+}\mathbf{J}_{22} \end{pmatrix}$ where $\mathbf{J}_1$ picks out the elements of $\mathbf{\Gamma}_1$ in $\mathrm{vec}\,\mathbf{\Gamma}$. Then

(A-13) $\mathrm{Var}\begin{pmatrix} \mathrm{vec}\,\hat{\mathbf{B}} \\ \mathrm{vec}\,\hat{\Lambda} \end{pmatrix} = \mathbf{F}_2'\mathbf{F}_1'\mathbf{V}\mathbf{F}_1\mathbf{F}_2$

where **V** is as defined in (A-7).

If $\mathbf{B} = \begin{pmatrix} B_1 \\ B_2 \\ \vdots \\ B_p \end{pmatrix}$ and $\mathbf{\Lambda} = (\lambda_1, \lambda_2, \cdots \lambda_p)$ then $\Gamma_0 = \Lambda\mathbf{B} + \alpha = \alpha + \sum_i \lambda_i B_i$ which is the basis for decomposing $\hat{\Gamma}_0$ into contributions through the *p* channels, $\hat{\lambda}_i\hat{B}_i$ for *i=1,...p*, and also for estimating α. Furthermore $\mathrm{d}\,\hat{\lambda}_i\hat{B}_i = \hat{\lambda}_i\mathrm{d}\,\hat{B}_i + \left(\mathrm{d}\,\hat{\lambda}_i\right)\hat{B}_i$ from which standard errors on the components of the decomposition can easily be calculated given the formula above for the joint distribution of $\hat{\mathbf{B}}$ and $\hat{\Lambda}$.

We can relax the assumption $\mathbf{C} = \mathbf{0}$. Suppose, say, that $\mathbf{C} = ec$ where e is a $q \times 1$ vector of ones and c is a $1 \times k$ row vector of elements to be estimated. Then $\boldsymbol{B}$ and c are jointly estimated by $\begin{pmatrix} \hat{\mathbf{B}} \\ \hat{c} \end{pmatrix} = (\hat{\mathbf{M}}\, e)^{+\prime} \hat{\boldsymbol{\Gamma}}_1$.

We can weaken this even further by keeping $\mathbf{C} = \mathbf{ec}$ but generalizing $\mathbf{e}$ to a $(q \times p)$ matrix of ones and zeros

$$\mathbf{e} = \begin{pmatrix} e_1 & 0 & \dots & 0 \\ 0 & e_2 & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \dots & e_P \end{pmatrix} \text{ and } \mathbf{c} \text{ to a } (p \times k) \text{ matrix } \mathbf{c} = \begin{pmatrix} c_1 \\ c_2 \\ \vdots \\ c_p \end{pmatrix} .$$

Standard errors are calculated in line with the procedure described earlier for the simpler case.