An Estimation of the Economic Impact of Migrant Access on GDP: the Case of the Madrid Region

Rafael de Arce* and Ramon Mahia*

ABSTRACT

In recent years, the Madrid Region (Comunidad de Madrid) has experienced a huge increase in immigrants accessing the labour market. In this paper, a dynamic input-output exercise is presented, yielding the direct and indirect effects of this migration inflow on the Madrid GDP. In addition, the induced demand effect is estimated, offering a complete estimate framework of the impact of migrant access on regional value added.

INTRODUCTION

In the field of migration phenomena, and from an economic perspective, the majority of research papers are focused on revealing the economic causes of human flow and only to a lesser extent on the economic impact of migration on the host country. In addition, most well-known papers on the topic of economic consequences of migration in the destination country are specifically oriented to analysis of the impact of migration in a precise area such as, for example, native salaries or unemployment rates. In contrast, it is unusual to find studies of the influence of migration on a host country going beyond “impact” into “contribution” to the entire economy and, specifically, to growth and structure of GDP.

The Spanish “economy side” of migration is quite specific for a variety of reasons, in particular because of the high incidence of illegal immigrant workers in the labour market and the scarcity of updated figures of economic migration participation characteristics; therefore, some of the most interesting papers on this subject in Spain (see, for example, Izquierdo et al., 2007; Carrasco et al., 2008) use outdated data from the beginning of the decade and do not include figures on illegal workers in their computations.

In this article, an analysis of the economic effects of migrants on the GDP of the Madrid Region is carried out, taking into consideration the arrival of more than 1 million economic immigrants in only seven years: 18 per cent of the population of the region in 2007.

According to immigrant employment and distribution, an updated estimate of migrant salaries is made, taking into account various qualitative and quantitative reports available concerning this phenomenon. From quantification and characterisation of salary amount, the

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impact of migrant employment in GDP is estimated, using the dynamic Ghosh and Leontief models.

In this framework, two basic effects on the economy are considered, derived from migrant access:

a. Firstly, the value added derived directly from migrant employees and the value added generated by the economic sectors where they are employed (in other words, the value added from the providers of sectors where the migrant workers are employed); this impact is said to be the “production effect”.

b. Secondly, the value added generated by recent private consumption in the economy related to the living standards of the immigrant population. This effect is called the “induced demand effect”.

The estimate schema proposed in this paper is frequently used in the context of international and national simulation models. One of the first seminal Spanish studies in this field can be seen in Canlas et al. (1976). Treyz (1993) developed a new technical proposal with a dynamic system model. In the regional context, these models are widely used, as pointed out in Fontela (1994). Several Spanish regional governments have developed their own models using a similar methodology in order to evaluate the effects of public stimulus (“Lanere Model, 1989”, in the Basque Country and “MECA Model in Andalucía”, Isla, 2000; “Iles Balears/2000” and “Catalunya/2000 Models”; López et al., 2002).

In the context of trade flow modelling, computable general equilibrium (CGE) models based on I-O structure are quite common, as pointed out in Piermatirni (2005). Surprisingly, these types of models are not particularly usual in the framework of migration effect on a host country. In the early 1980s, we found kind of a similar approach to this research methodology in Carlberg (1980), where the author studied the migrant phenomenon in the framework of international interchanges. In Madden et al., (1996), the writers investigated the changes in an economy brought about by various causes, including migrant integration into the labour market, using Leontief coefficients to estimate technical changes. As to the possibilities of adding dynamic mechanisms to the I-O structure, interesting findings are shown in Liew (2000), Ferri (2001), and Femise (2005).

The use of these types of models and the incorporation of wider effects through a social account matrix are largely discussed in Uriel (2005) and Polo (2001). A similar analysis proposal is used in Arce and Mahia (2004) for estimating free trade agreement effects on a national economy.

Related to the evolution of productivity during our research period, the qualitative and quantitative information used in this research allow us to obtain an Input-Output (I-O) framework, adapting the production scheme to the current status of the economy in the Madrid Region, obviously partially induced by migrant access to the labour market. Particularly in the context of this research, obtaining a good schema of labour productivity evolution is crucial; hence, the updated but partial information obtained through regional accounts from 2000 to 2006 is a natural way to increase fairness in our results. For 2007 only, we were forced to use a linear trend extrapolation in order to obtain an estimate of apparent labour productivity.

After these considerations, it is necessary to point out that this model is a useful tool for estimating the current effect of introducing an employee into a specific sector of the economy. This estimate is based on the premise that the production structure is unchanged in the short term; therefore, the I-O tables are available to guide this effect through the links connecting all sectors of the economy.
This paper starts with the mathematical and methodological aspects used to estimate this impact. In sections 3, 4, 5, and 6 the results pertaining to migrant access are shown, and in section 7 we present our conclusions.

METHODOLOGICAL FRAMEWORK

The main target of this simulation is to determine the global impact on the Madrid Region economy of migrant access to the labour market in recent years. This global impact is understood as the sum of two principal components: (i) “production effect”, derived directly from migrants’ work in the production system, and (ii) “induced demand effect”, derived from their expenditures in terms of private consumption in the Madrid Region.

Firstly, from the estimated total amount of compensation of employees (COE, distinguishing between regular and irregular), the increase in gross operating surplus (GOS) is deduced using the relationship between these two magnitudes.

\[
\text{Coeff}_{\text{GOS}_i} = \frac{\text{GOS}_i}{\text{COE}_i}
\]

\[
\text{COE}_i = \text{Coeff}_{\text{GOS}_i} \times \text{COE}_i
\]

Secondly, an estimate of taxes less subsidies (TLS) on production and imports is derived.

\[
\text{Coeff}_{\text{Taxes}} = \frac{\text{TLS}_{i-o}}{\text{COE}_{i-o}}
\]

\[
\text{ProductionTaxes}_i = \text{Coeff}_{\text{Taxes}} \times \text{COE}_i
\]

Using the previous results we can then compute the direct production effect through the following expression:

\[
\text{ValueAdded}_i = \text{COE}_i + \text{GOS}_i + \text{TLS}_i
\]

In both calculations, direct coefficients from official regional accounts are used; therefore, we have updated data for 28 sectors through 2005 and for 5 sectors through 2006. With this statistical information, we can observe and compute a specific coefficient for each marginal corresponding to each sector.

In order to obtain the total production effect, including the connections between sectors, we employ a Ghosh model according to the schema presented in the following chart:

In the Ghosh model, the equilibrium or transmission effects equation from value added to final production is specified as follows:

\[
\text{VA}(I-D)^{-1} + [(TR + M + IVA) \times D](I-D)^{-1}
\]

Where:

\(VA\) = value added by sectors

\(TR\) = vector of received transfers by sector

\(M\) = vector of imports

\(IVA\) = vector of taxes on value added

\(D\) = distribution coefficients matrix (distribution coefficients are calculated as the proportion of final production for each sector bought for the other sectors). Mathematically (\(i = \) rows and \(j = \) columns in I-O structure):

\[
d_{ij} = \frac{x_{ij}}{P_j}
\]
Once the “production effect” is estimated, we can then use the Leontief model to connect the employment generated in the previous section with the final demand in the I-O system in order to determine the induced demand effect. The schema used for this transmission is presented in figure 2.
Where, now, the equilibrium equation is “Leontief’s inverse”:

$$P = (I - A)^{-1}D$$

Where:
- $P = \text{vector of total production for each sector}$
- $A = \text{technical coefficient matrix}$

$$a_{ij} = \frac{x_{ij}}{P_i}$$

Where:
- $x_{ij} = \text{commodity of } j \text{ sector sold to sector } i$
- $a_{ij} = \text{technical coefficient of production (share of the total production of sector } j \text{ including products from sector } j)$
- $P_i = \text{total production of sector } i$
- $D = \text{vector of final demand}$

As a result of these models, the increase in global production derived from an increase in the value added of each sector (production effect through the Ghosh model) is obtained, and the equivalent increase derived from an increase in consumption is revealed using the Leontief model (induced demand effect). In order to obtain the equivalence between these productions with the related value added and employment creation, the following coefficients are used:

$$\text{Coeff. } VA_{j} = \frac{VA_{j, \text{yearTIO}}}{PRod_{j, \text{yearTIO}}}$$

$$\text{Coeff. } Emp_{jt} = \frac{Emp_{jt}}{VA_{jt}}$$

In the previous expressions, a fixed relationship between value added and production is assumed (taking the results of these calculations from the I-O figures). This assumption is acceptable when we are considering a short period in our simulations (this coefficient is not likely to change dramatically in the short-term).

In the case of employment coefficients, more updated information is available from regional accounts covering the period 2000 to 2006. With this information, the employment coefficients (equivalent to the inverse of labour apparent productivity coefficients) can be obtained for each year of our research except for 2007. In order to obtain the coefficient for 2007, a simple trend regression from the last six years can be used. This coefficient will be a key aspect of the simulation for observing its consistency with the real data for the total economy. With the changes in productivity properly estimated, the results of our simulation should agree with the real figures of employment creation for the simulation period. With some iterations of the process, the simulation is calibrated to be consistent with the real scenario of the economy.

The phases and assumptions used in this research can be summarised as follows:

a. Determination of regular and irregular migrant per capita wages in each economic sector of the Madrid Region.

The estimate of legal and illegal migrant wages is an essential first step because of lack of updated information on wages of migrant workers and, of course, a complete absence of official statistics on illegal migrants.

In order to estimate these wages, we take official data on salaries for the entire population (not only migrants) and then observe the crossed distribution of wages by different socioeco-
nomic determinants (age, sex, sector, nationality, etc.). Assuming no wage discrimination against migrants, we then observe these socioeconomic characteristics of the different main profiles of immigrants, obtaining a proxy estimate of salaries for the entire group of legal workers. In addition, for the irregular workers the results of a survey conducted by the Institute L. R. Klein of Madrid were considered.

b. Determination of the total compensation of migrant employees.

To compute the total compensation of migrant employees once the migrant per capita wage was derived, we needed to determine the number of working migrants in every sector of activity (divided into regular and irregular). For that purpose we used the available information on employment in the Labour Force Survey for Spain (*Encuesta Población Activa, INE*). For the case of irregular workers, a sector distribution was made, simply assuming the same proportions as regular workers with the exception of proportions of female migrant workers in the paid housework sector.

In addition to labour force statistics, and in order to obtain a better estimate of the total number of migrant workers (legal and illegal) in the Madrid Region, we used municipal census records (*padron municipal*). This kind of census is extremely useful for accurate measurement of immigration volume because, according to current law, healthcare and other social benefits require compulsory registration in municipal censuses; thus, the majority of migrants are conveniently registered.

c. Analysis of total value added creation from direct value added derived from migrant incorporation into the labour market.

Using the more updated I-O tables for the Madrid Region, we can deduce two relatively constant coefficients:

\[
\text{Coef}_\text{Taxes} = \frac{\text{TLS}_{1-O}}{\text{COE}_{1-O}} \\
\text{Coef}_\text{GOS}_t = \frac{\text{GOS}_t}{\text{COE}_t}
\]

Obviously, the relationship between gross operating results and value added has dramatically changed with migrant access to the labour market. In any case, updated information on this relationship from regional accounts is available (detailed by sectors) and allows us to calculate these coefficients for the period of analysis.

From the Ghosh model, we can obtain the total effect of this increase in value added through an industrial intermediate consumption matrix (using the distribution coefficients derived from intermediary consumption in I-O) and then estimate indirect production effects, providing a more realistic representation of the macroeconomic links between sectors and their combined multiplicative effects.

d. Estimation of induced demand effect of migrant consumption in the Madrid Region.

In a second derivative or stage, it is necessary to consider that the contribution to the growth of value added is not only bound to production contribution, but also linked to the expenditure (consumption) of immigrant workers in the region.
For the estimate of this second order effect, a Leontief prices model is applied. Previously, it was necessary to estimate migrants’ disposable net income available for consumption, deducting direct taxes, social security charges, and savings from their gross salaries. Once the disposable income for consumption is calculated, an estimate of the basket of migrant consumption is needed in order to properly distribute the demand effect in each sector of the I-O tables.

ESTIMATE OF MIGRANT SALARIES AND WAGES IN THE MADRID REGION

a) Determination of wage by migrant

In estimating salaries, it is necessary to take into account some variables that crucially affect wage level: economic sector, contract type (full- or part-time and/or fixed or open ended), gender, nationality, and legal or illegal status of immigrant employee.

In Table 1, with official data for 2002, relative differences in immigrant salaries compared with native salaries are shown, depending on sector of activity, gender, and nationality.

These differences, suggesting discrimination against immigrants versus native workers and among immigrants themselves, can be explained, maybe to a great extent, by simple labour factors such as differences in types of contracts and in skills, and level of experience and heterogeneity of activities within the sectors. In this sense, using official data from the 2002 Salaries Structure Survey (Encuesta de Estructura Salarial, 2002), great variation in wages can be observed depending solely on contract and gender (Table 2).

From the previous figures, differences of 25-30 per cent in the total average wage can be observed just on account of this factor. This fact is crucial when estimating the differences between native and migrant salaries; considering the massive entry process of migrants into the labour market taking place since 2000, it is consistent to think that only a small portion of

<table>
<thead>
<tr>
<th>Geographic detail</th>
<th>Total</th>
<th>Industry</th>
<th>Building</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males &amp; Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Europe</td>
<td>68%</td>
<td>68%</td>
<td>82%</td>
<td>66%</td>
</tr>
<tr>
<td>Latin America</td>
<td>65%</td>
<td>73%</td>
<td>76%</td>
<td>63%</td>
</tr>
<tr>
<td>Africa</td>
<td>67%</td>
<td>65%</td>
<td>83%</td>
<td>62%</td>
</tr>
<tr>
<td>Asia</td>
<td>74%</td>
<td>90%</td>
<td>100%</td>
<td>66%</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Europe</td>
<td>65%</td>
<td>67%</td>
<td>81%</td>
<td>60%</td>
</tr>
<tr>
<td>Latin America</td>
<td>67%</td>
<td>74%</td>
<td>76%</td>
<td>67%</td>
</tr>
<tr>
<td>Africa</td>
<td>62%</td>
<td>62%</td>
<td>82%</td>
<td>56%</td>
</tr>
<tr>
<td>Asia</td>
<td>69%</td>
<td>89%</td>
<td>97%</td>
<td>66%</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Europe</td>
<td>73%</td>
<td>67%</td>
<td>-</td>
<td>74%</td>
</tr>
<tr>
<td>Latin America</td>
<td>62%</td>
<td>71%</td>
<td>56%</td>
<td>62%</td>
</tr>
<tr>
<td>Africa</td>
<td>62%</td>
<td>59%</td>
<td>-</td>
<td>62%</td>
</tr>
<tr>
<td>Asia</td>
<td>84%</td>
<td>84%</td>
<td>-</td>
<td>82%</td>
</tr>
</tbody>
</table>

Authors’ elaboration based on Encuesta salarial, 2002 (INE).
migrants have open-ended contracts. This consideration is fundamental in the industry and services sectors, where the application of “contracts due to production necessities” is not as flexible as in the building sector.

Considering irregular (or illegal) workers, no official information exists on their salaries, but explicit evidence can be shown that these kinds of contracts can experience greater wage discrimination than those of regular paid workers. In order to estimate this difference, we have taken the results of the Institute L. R. Klein (2006) experts’ Delphi panel referring to Madrid (see note 6). Stacking the micro-data of this survey, we can derive the differences shown in Table 3.

Taking into account all these considerations, our working hypothesis of migrant wage estimate in the Madrid Region is summarised in Table 4.

Finally, detailed data can be included in the previous figures with segmentation by gender. Using the base of the Quarterly Salaries Survey (INE) and the number of employees by sector and gender from the Labour Force Quarterly Survey (EPA), we obtain the results shown in Table 5.

We can find similar results in the Madrid survey cited above for the case of regular migrant workers in the Madrid Region; therefore, we can point out that the low salaries obtained are due not only to the nationality aspect (discrimination), but also to labour characteristics (duration of contracts, seniority, professional skills, educational background, etc.). Similar conclusions can be found in Carrasco et al. (2008).

b) Determining the total wages of migrants

From the previous results, and taking into account the number of employees by sector, salaries and wage aggregates can be calculated.
In any case, a sensitive issue must be considered in this calculation. A decision must be made whether to assign the irregular workers to the different sectors. Concerning this problem, two options are available: (i) assign irregular workers in the same proportions as regular migrants, or (ii) assign these workers by applying one criterion that can differentiate between the informal economy present in each sector, deriving the irregular workers in the sector with a greater predisposition to employ workers without contracts.

Although it is frequently assumed that some sectors have a greater presence of irregular workers than others, no statistical evidence has been given on that; thus the same proportion is assumed. The only exception is made for the case of domestic help workers: according to the last migratory amnesty process figures, 85 per cent of irregular female workers seeking labour permission were irregularly employed in domestic help activities.

As summarised in Table 6, the total amount of migrant wages in the Madrid Region could represent around 5.8 million euros in 2007. This amount represents 3.3 per cent of the GDP of the region. The migrant total wages in the informal economy could be 25–30 per cent of this amount.

Unsurprisingly, the services and building sectors are the most significant sectors in the distribution of these salaries. The major concentration of the informal economy in services increases the share of this concept (30%) compared with the 25 per cent observed for the total economy average.

<table>
<thead>
<tr>
<th>TABLE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIGRANT WAGE ESTIMATE DETAIL BY REGULAR/IRREGULAR AND SECTORS OF ACTIVITY</td>
</tr>
<tr>
<td>(EUROS, 2007)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Monthly average per person</td>
</tr>
<tr>
<td>Annual average per person</td>
</tr>
<tr>
<td>Net annual salary</td>
</tr>
<tr>
<td>Net annual salary (regular)</td>
</tr>
<tr>
<td>Net annual salary (irregular)</td>
</tr>
<tr>
<td>Net monthly salary (regular)</td>
</tr>
<tr>
<td>Net monthly salary (irregular)</td>
</tr>
</tbody>
</table>

Authors’ estimates

<table>
<thead>
<tr>
<th>TABLE 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIGRANT WAGE ESTIMATE DETAIL BY REGULAR/IRREGULAR AND GENDER (EUROS, 2007)</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Regular</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Irregular</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ estimates
Frequently, the relationship between salaries and wages and company margins or profits is omitted in the research on this subject. In the case of migrants, the majority of the employees are wage-earning. Obviously, there is a connection between this increase in wage-earning jobs and the increase in company margins (or autonomous worker margins).

Mathematically, the total value added of each sector is computed as the sum of compensation of employees (COE) (social security charges included), gross operating surplus (GOS\(^7\)), and taxes less subsidies (TLS) on production and imports. With the available information from I-O and regional accounts from INE, the coefficient of GOS divided by COE can be obtained for the period 2000 to 2006. In 2007, the coefficient must be estimated with a simple linear interpolation of previous data. With these coefficients and the result of the previous section for total wages and salaries by sector, an estimate of the gross operating surplus can be easily obtained.

The amount of taxes less subsidies is almost a residual quantity, but in any case, the coefficient TLS over COE has been calculated and maintained as a constant for the entire period. Direct value added is computed by adding the three components. In summary, the accession of migrants to the Madrid Region labour market could represent 5.74 million euros of new gross surplus. Adding this amount to the total compensation of workers, we obtain 12.6 million euros; thus, the total direct effect would be, approximately, 7.3 per cent of GDP of the Madrid Region. Sector details for these magnitudes are shown in Table 7.

At this point, the I-O Ghosh equation must be used to estimate the chain effects of these increases in the sectors of value added on the rest of the economic system. Using these input data in the Ghosh model, we found an additional increase of 1.63 per cent with respect to the previous results (due to indirect effects in the economy estimated through the I-O Ghosh model).
In summary, the total “production effect” (direct plus indirect) is estimated to be around 8.93 per cent of the GDP for the Madrid Region.

**NEW DISPOSABLE YIELD FOR CONSUMPTION**

Using the estimate of employees and their wages and salaries from the previous sections, the next question is, what is the new demand for consumption that these paid workers add to the Madrid Region?

Some previous issues must be resolved before launching the I-O Leontief model to answer this question. The savings and remittance ratio, fiscal pressure, and pattern of consumption by migrants must be determined.

Regarding the pattern of consumption by migrants, unsurprisingly no explicit information exists. A simple assumption for compensating for lack of information is to identify immigrant families with those native families of the lower yield decile and thus use the same struc-

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**TABLE 7**

DIRECT VALUE ADDED BY INCORPORATION OF MIGRANTS
(MILLIONS OF EUROS)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Compensation of Workers</th>
<th>Gross Surplus</th>
<th>Value Added</th>
<th>% GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>143</td>
<td>103</td>
<td>190</td>
<td>0.11%</td>
</tr>
<tr>
<td>Energy</td>
<td>8</td>
<td>15</td>
<td>23</td>
<td>0.01%</td>
</tr>
<tr>
<td>Electronics and heavy industry</td>
<td>141</td>
<td>73</td>
<td>216</td>
<td>0.12%</td>
</tr>
<tr>
<td>Vehicles industry</td>
<td>8</td>
<td>4</td>
<td>12</td>
<td>0.01%</td>
</tr>
<tr>
<td>Food, drinks and tobacco</td>
<td>89</td>
<td>84</td>
<td>172</td>
<td>0.10%</td>
</tr>
<tr>
<td>Clothes and shoes</td>
<td>22</td>
<td>15</td>
<td>37</td>
<td>0.02%</td>
</tr>
<tr>
<td>Chemical and Pharmacy</td>
<td>11</td>
<td>10</td>
<td>21</td>
<td>0.01%</td>
</tr>
<tr>
<td>Paper and edition</td>
<td>23</td>
<td>25</td>
<td>48</td>
<td>0.03%</td>
</tr>
<tr>
<td>Wood and furniture</td>
<td>88</td>
<td>47</td>
<td>136</td>
<td>0.08%</td>
</tr>
<tr>
<td>Others industries</td>
<td>31</td>
<td>23</td>
<td>55</td>
<td>0.03%</td>
</tr>
<tr>
<td>Building</td>
<td>1,955</td>
<td>1,041</td>
<td>3,042</td>
<td>1.76%</td>
</tr>
<tr>
<td>Wholesale</td>
<td>162</td>
<td>144</td>
<td>306</td>
<td>0.18%</td>
</tr>
<tr>
<td>Vehicles sales</td>
<td>103</td>
<td>112</td>
<td>216</td>
<td>0.13%</td>
</tr>
<tr>
<td>Other commercial services</td>
<td>621</td>
<td>431</td>
<td>1,079</td>
<td>0.62%</td>
</tr>
<tr>
<td>Restaurants, bars, pubs</td>
<td>913</td>
<td>2,207</td>
<td>3,136</td>
<td>1.82%</td>
</tr>
<tr>
<td>Transport</td>
<td>96</td>
<td>83</td>
<td>177</td>
<td>0.10%</td>
</tr>
<tr>
<td>Communications</td>
<td>139</td>
<td>321</td>
<td>460</td>
<td>0.27%</td>
</tr>
<tr>
<td>Real State services</td>
<td>37</td>
<td>282</td>
<td>322</td>
<td>0.19%</td>
</tr>
<tr>
<td>IT Services</td>
<td>35</td>
<td>20</td>
<td>56</td>
<td>0.03%</td>
</tr>
<tr>
<td>Professional services</td>
<td>657</td>
<td>346</td>
<td>1,007</td>
<td>0.58%</td>
</tr>
<tr>
<td>Health (market)</td>
<td>162</td>
<td>170</td>
<td>334</td>
<td>0.19%</td>
</tr>
<tr>
<td>Leisure services</td>
<td>66</td>
<td>45</td>
<td>111</td>
<td>0.06%</td>
</tr>
<tr>
<td>Personal services</td>
<td>155</td>
<td>65</td>
<td>225</td>
<td>0.13%</td>
</tr>
<tr>
<td>Finance services</td>
<td>22</td>
<td>-2</td>
<td>20</td>
<td>0.01%</td>
</tr>
<tr>
<td>Insurance services</td>
<td>12</td>
<td>14</td>
<td>25</td>
<td>0.01%</td>
</tr>
<tr>
<td>Government Services</td>
<td>20</td>
<td>4</td>
<td>24</td>
<td>0.01%</td>
</tr>
<tr>
<td>Public education</td>
<td>65</td>
<td>2</td>
<td>67</td>
<td>0.04%</td>
</tr>
<tr>
<td>Public conservation activities</td>
<td>12</td>
<td>50</td>
<td>65</td>
<td>0.04%</td>
</tr>
<tr>
<td>Associative services</td>
<td>12</td>
<td>5</td>
<td>18</td>
<td>0.01%</td>
</tr>
<tr>
<td>Domestic personnel</td>
<td>1,001</td>
<td>0</td>
<td>1,001</td>
<td>0.58%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6,810</td>
<td>5,740</td>
<td>12,600</td>
<td>7.3%</td>
</tr>
</tbody>
</table>

Source: Authors’ estimates
ture of the consumption basket as for the native households; however, we speculated that the consumption decisions of migrants might be quite different from the poorer national households and therefore preferred to use the evidence derived from a survey by Institute L. R. Klein (2006) on the topic of migrant consumption habits. The two groups have different consumption behaviour that must be taken into consideration. Although this survey is not the official source of information, it has been elaborated with a more extensive sample than the official data, and its goals could be closer to reality than the INE survey because of the low representation of these persons in the current sample.

The total consumption shown in this survey, see Table 8, (471 euros per person per month) is consistent with the average level of consumption of the poorer yield decile data monitored by the official INE data. On the contrary, and in line with our expectations, the proportions of different items in the migrant’s consumption basket, its structure, is quite different.

The total wages and salaries of migrants computed in the previous sections minus the total estimate of consumption expenditure could be a preliminary estimate of net disposable income for domestic savings (and remittances). Obviously, it is very difficult to determine the proportion of these savings that could be considered remittances, but this issue is not important for our purposes.

3. Estimate of the induced demand impact and total summary effect

The above estimates suggest that migrant consumption in the Madrid Region could be around 4.303 million euros in 2007. Obviously, part of this consumption is not produced in the region (from the ratio of “imports” to total production of I-O, we can establish the net amount specifically produced in the Madrid Region). Subtracting imports, we find the total increase in consumption directly linked with Madrid economic sectors could be around 3.35 million euros (in terms of production, not in terms of value added).

Applying the Leontief prices model, total induced demand is estimated (direct and indirect effects included), linking this production in each sector with the need for these sectors to cover this direct demand. After that, through the value added/production coefficient, value added in the Madrid Region can be obtained. In our simulation, this amount is about 3.011 million Euros, representing 1.74 per cent of Madrid GDP. The short sector detail is presented in Table 9.

<table>
<thead>
<tr>
<th>Consumption</th>
<th>Euros</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and non-alcohol beverages</td>
<td>108.44</td>
<td>23.0%</td>
</tr>
<tr>
<td>Alcohol beverages, tobacco, and narcotics</td>
<td>14.72</td>
<td>3.1%</td>
</tr>
<tr>
<td>Clothes and shoes</td>
<td>27.00</td>
<td>5.7%</td>
</tr>
<tr>
<td>Household, water, electricity, and other combustibles</td>
<td>188.36</td>
<td>40.0%</td>
</tr>
<tr>
<td>Furniture and household expenditures</td>
<td>13.32</td>
<td>2.8%</td>
</tr>
<tr>
<td>Health</td>
<td>5.28</td>
<td>1.1%</td>
</tr>
<tr>
<td>Transport</td>
<td>19.48</td>
<td>4.1%</td>
</tr>
<tr>
<td>Communications</td>
<td>20.56</td>
<td>4.4%</td>
</tr>
<tr>
<td>Leisure, entertainment, and culture</td>
<td>5.72</td>
<td>1.2%</td>
</tr>
<tr>
<td>Education</td>
<td>8.64</td>
<td>1.8%</td>
</tr>
<tr>
<td>Hotels, bars, and restaurants</td>
<td>21.96</td>
<td>4.7%</td>
</tr>
<tr>
<td>Other</td>
<td>37.36</td>
<td>7.9%</td>
</tr>
<tr>
<td>Total</td>
<td>470.84</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Authors’ elaboration of Instituto LR Klein Survey (2006)
Summarising, the different impacts introduced in the I-O structure through the coefficient previously analysed produce an impact estimate of 10.7 per cent of GDP (directly and indirectly) from migrant access to the Madrid Region labour market, on the basis of available information for 2007. Obviously, the greater part of this contribution is related to the direct incorporation of migrant production in the Madrid production structure (8.93%), but, in any case, it is also important to add the weight of migrant consumption expenditure in the economy of Madrid (1.74%). See a summary in Table 10.

### SUMMARY AND CONCLUSIONS

In this article, the positive contribution to GDP of migrants’ access is shown. A complete methodological approach to this contribution is developed through a consistent I-O schema, employing a reasonable hypothesis framework when available statistical information is not accurate.

Some interesting findings can be pointed out:

1. In terms of GDP, the compensation of employees (salaries and wages) linked to the migrant population represents 3.3 per cent of total value added.
2. The informal economy in the field of immigration could represent around 28–30 per cent of received wages: 1 per cent of the 3.3 per cent of total contribution.
3. The increase in the operating surplus of firms can be estimated at around 3.3 per cent due to migrant contribution. Adding wages and margins, we obtain a direct effect estimated at 7.3 per cent, called the production effect of the incorporation of migrants into the Madrid Region labour market.

4. Taking into account the links between economic sectors through the Ghosh model, we observe that the total production effect (direct plus indirect) of the incorporation of migrants into the Madrid Region labour market is 8.93 per cent of total value added.

5. The effect of migrant expenditure of consumption in the Madrid Region (induced demand effect) is estimated at 1.63 per cent of Madrid value added.

6. In summary, the economic weight of migrant contribution to Madrid value added could be 10.67 per cent in 2007.

STATISTICAL SOURCES

- Encuesta de estructura salarial INE: año 2002 (publicada 16 de noviembre de 2004) y avance de resultados año 2004 (publicada el 29 de diciembre de 2006)
- Encuesta de salarios en España
- Encuesta de Población Activa (several years)
- Input-Output frame Comunidad de Madrid 2001 y 2002
- Regional Accounts Instituto Nacional de Estadística

NOTES

1. Borjas (1995, 1999), Borjas et al. (2008), Gavosto et al. (1999), and Herrador (2001), among others.
2. We use the term “illegal” to refer to those immigrants without administrative permission to work.
3. Of course, official data on illegal workers has not been kept, but the estimated percentage is around 25-30 per cent (depending on the source of estimation).
4. In this research, we focus on what we call “economic migration”: those migrants coming from less developed or underdeveloped countries, who leave their homes in order to improve their life conditions.
5. Although some valuable approaches exist in previous literature for analysis of the impact of migration in Spanish wages (see, for instance, Carrasco et al., 2008), the majority of these papers use data from the “2002 Spanish Salaries Survey”. The lack of updated information forced us to consider several analytical hypotheses that have been properly described in the article, but considering that relevant migration flows did not start in Spain before 2000, a strategy to update information can be considered essential.
7. Including gross mixed income (GMI)
8. Assuming that direct taxes supported by migrants could be almost residual. The current laws establish a tax exemption for a minimum yield, well above the rent of the majority of migrants.
9. Given the fact that we are speaking about a “region”, we must consider as “imports” all the products elaborated in a foreign country or in another region of the same country.
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Lorca, A., and R. de Arce
APPENDIX: EQUATIONS LOGICAL CHAIN

1. Production effect

1.A. Direct Production Effect

Social Security = Regular migrant salaries * 0.36
Migrant salaries and wages = Regular migrant salaries + Social Security
  + Irregular migrant salaries

From I-O tables and Regional Accounts for total economy

$$\text{Coef}_{\text{GOS}_t} = \frac{\text{GOS}_t}{\text{COE}_t}$$

$$\text{Coef}_{\text{Taxes}} = \frac{\text{TLS}_{t-0}}{\text{COE}_{t-0}}$$

$$\text{GOS}_t = \text{Coef}_{\text{GOS}_t} * \text{COE}_t$$

Production Taxes = Coef_Taxes * migrant salaries and wages

Value Added = COS + GOS + TLS

Row vector (1 x sectors)

$$\text{ValueAdded} \rightarrow VA$$

1.B. Total Production Effect

Elements of Distribution Matrix (from I-O tables): D
\[ d_{ij} = \frac{x_{ij}}{P_j} \]

Obtaining the total associated production from Ghosh model (PROD vector)

\[ PROD = VA(I - D)^{-1} + [(Tr + M + IVA) \ast D](I - D)^{-1} \]

From I-O tables for total economy

\[ Coef.VA_j = \frac{VA_{jI-O}}{Pr_{od_{jI-O}}} \]

Obtaining the total associated value added (VA vector)

\[ VA_j = PROD_j \ast Coef.VA_j \]

2. Induced demand effect

2.A. Direct Induced Demand Effect

Disposable Consumption Yield = DCY = migrant salaries and wages (1- Fiscal Pressure Rate – Savings and Remittances Rate)

Distribution by consumption sectors (consumption basket; see text above). Column vector (sectors x 1):

\[ DCY \rightarrow D \]

2.B. Total Induced Demand Effect

Elements of A matrix: technical coefficients from I-O tables

\[ a_{ij} = \frac{x_{ij}}{P_i} \]

Obtaining new production:

\[ P = (I - A)^{-1}D \]

Obtaining the total associated value added (VA vector)

\[ VA_j = PROD_j \ast Coef.VA_j \]